January 1975
Volume 19
Number 1

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Mariners Weather Log

National Oceanic and Atmospheric Administration • Environmental Data Service

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Mariners Weather Log

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January 1975
Volume 19 Number 1
Washington, D.C.

Routing
Master _____
Observing Officers
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Radio Officer _____

PARTICIPATE IN AMVER

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Cover: Wind-whipped seas and their accompanying spray and foam present a hostile environment for the mariner to transit. Optimum track ship routing at times can avoid such conditions. For the Navy's ship-routing program, see article on page 1.

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget through June 30, 1975.

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Mariners Weather Log

OPTIMUM TRACK SHIP ROUTING AT FNWC, MONTEREY

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INTRODUCTION

A major change in the government's Pacific ship routing activity occurred during the summer of 1971. This change was the transfer of the U.S. Navy's Optimum Track Ship Routing (OTSR) service from Fleet Weather Central, Alameda, to the Fleet Numerical Weather Central (FNWC) in Monterey, Calif. The transfer to FNWC Monterey, with its staff intact, provided OTSR the benefit of closer liaison with the Navy's primary center for computer-oriented meteorological support and development.

From 1958 until the move in 1971, Alameda issued approximately 20,000 recommended routes for government time-chartered ships and fleet units, and provided continual surveillance and diversions while these ships were underway. While the basic ship routing service is still being provided, the association with civilian as well as Navy computer specialists has brought about some significant innovations to the problem of extended forecasting for ocean transits by ships. The procedures that were developed and are now in use provide the ship-routing meteorologist with a more accurate method of initial route selection and a method for evaluating alternatives for track change when faced with a potentially adverse environment.

NUMERICAL WEATHER PRODUCTS AVAILABLE TO OTSR

The primary meteorological products already available at FNWC Monterey, and those specifically tailored for ship-routing use, include the full range of surface pressure, upper-air, and combined sea heights analyses and forecasts. These are machine-drawn charts that are available to the ship-routing meteorologist each 12 hr, with the forecasts extending to 72 hr.

The basic surface pressure and wave height forecasts are computed from the meteorological equations called primitive equations (PE). The range of the PE, or deterministic forecast, is 72 hr and is computed from a data base which includes Northern Hemisphere land and ship synoptic surface and upper-air observations. To provide verification and insure quality control, a combined wave height analysis of the North Pacific is drawn four times daily by the ship router and compared with the machine wave height products.

In order to provide forecasts of winds and seas for extended periods, those beyond the range of the PE, the computer searches a 28-yr past history library of Northern Hemisphere Surface Pressure and 500-mb Charts for an analogous weather pattern (analogs). This search is an attempt to match the current weather pattern with previous patterns and provide a logical sequence-of-events forecast for the next 10 days. This procedure is performed for both the Pacific and Atlantic Ocean sectors, utilizing climatological data for the period 30 days before to 30 days after the current date. The program selects the seven best Pacific and ten best Atlantic matching dates for that 60-day period from the 28-yr library with the final product being a set of Surface Pressure and 500-mb Charts that are a composite of the dates selected. Provided with these analogous weather charts is a statistical evaluation of the relative skill in matching the current weather pattern with the historical composite for each ocean sector. Currently, the analog charts are available twice weekly, with plans to provide them daily as the selection process is refined and the required computer time is reduced.

Beyond the tenth day, climatological values for wind, seas, fog, and ocean currents are used to extend the time range of forecasts necessary for ocean transits. The analog and climatological products are called probabilistic because they are statistical in nature.

Thus, the ship-routing program uses the most accurate set of forecasts available for the time range that is required for initial route selection and determining track changes while underway.

DESCRIPTION OF SHIP ROUTING PROGRAMS

The primary goal for the ship-routing meteorologist is to provide best weather-minimum time tracks. The concept of the minimum time track is defined for

ship-routing purposes as a Global Minimum Time Route (GMTR). The GMTR is a navigationally correct route selected on the basis of a survey of winds and seas between the departure point or current ship's position and the destination.

The GMTR's are computed twice daily for a majority of the ships under OTSR from a complex program involving navigation, surveillance, constraints, ship performance curves, a phantom ship, and the basic FNWC forecast products previously described. The GMTR may recommend a track change that minimizes or avoids the effects of adverse winds and seas; or, to take advantage of optimum conditions, the GMTR may shorten the track. In either case, the GMTR is a solution to the problem of providing a best-weather, least-cost track for extended periods, where least cost is determined by per diem costs and the necessity to avoid adverse environmental factors which may expose the vessel to damage.

The navigation program is used to calculate route distance, time enroute, estimated time of arrival (ETA), and 6-hrly positions on the ship's current track corresponding to the synoptic times of 0000, 0600, 1200, and 1800 out to 72 hr. It can provide the above information twice daily on four separate tracks: the recommended or current track the ship is sailing, the GMTR from the current ship's position to destination, the great circle track from the current ship's position to destination, and the verification GMTR for a fictitious or phantom ship from departure point to destination.

The surveillance program surveys the environmental factors of winds, seas, fog, and ocean currents obtained from the PE, analogs, and climatological fields along the above four tracks.

A constraint system to minimize or avoid the effect of adverse environmental factors is employed both as a warning system and as an important part of the GMTR computation process. Constraints are used as a signalling system to warn the meteorologist when the ship is forecast to transit an area which exceeds certain predetermined limits of winds and seas. Then an attempt is made to limit the effect of these seas by computing a new GMTR. The constraints imposed are usually determined by the ship's loading, speed capability, and general characteristics. For example, a tug with tow would have low values of constraint for winds and seas because of its limited speed capability and vulnerability to those adverse environmental factors. A standard merchant hull or a large tanker with normal loading would have much higher values for winds and seas applied as constraints.

Ship performance curves, or speed curves, are used to approximate the ship's speed while transiting the forecast sea states. The curves are based on the ship's speed of advance (SOA) vs wave height and indicate the effect of seas on SOA for head, beam, and following conditions. If a ship is forecast to encounter very rough head seas, the normal SOA will be reduced with the navigation and remaining time enroute adjusted to indicate this reduction in SOA.

In order to provide verification and improve the meteorologist's forecasting techniques for ship routing, a fictitious or phantom ship is one method of postvoyage analysis that is being studied. This is done by concurrently sailing a phantom ship in the real world environment with the actual ship, but completely by computer with no changes being made by the ship router. The phantom ship's track is the GMTR computed at the actual departure time, and is dead reckoned automatically with speed curves and environmental constraints applied to that GMTR. This track is recomputed every 12 hr, with any change due to changing forecasts of winds and seas producing the phantom's new track. This procedure continues until the phantom reaches port, and the distance, time enroute, overall SOA, and conditions encountered are compared with the actual ship. Thus, a realistic comparison of costs and weather experienced is provided for postvoyage analysis and verification of the forecast products.

To summarize briefly, the navigation-surveillance program using the available FNWC analyses and products provides the ship routing meteorologist with:

1. Precise navigation, time enroute, and ETA's on several tracks.
2. Predeparture survey of environmental conditions in order to select the most feasible least-cost track.
3. Enroute surveillance of winds, seas, fog, and ocean currents, and the effect on the ship's SOA.
4. Enroute GMTR's computed from the ship's current position to destination.
5. Verification of the ship-routing system by an actual ship vs phantom ship comparison for postvoyage analysis.

BENEFITS OF AN OTSR SYSTEM

The benefits of the ship routing program are basically cost reduction and safety. To the master, the ship owner, and the government, an effective ship routing service means minimizing the possibility of storm damage to ship and cargo, and injury to passengers and crew. It also maximizes comfort and working conditions while reducing operating costs.

The savings in operating costs include reduced damage, less off hire time for emergency shipyard repairs, less fuel consumption, lower insurance, and fewer crew expenses. The savings are increased by being able to achieve more efficient and accurate scheduling of cargo operations, personnel use, and normal shipyard maintenance periods.

The costs of this ship routing are minimal in that the OTSR system uses weather products already available at Fleet Numerical Weather Central Monterey to provide this necessary service to the Fleet and the time-chartered and USNS ships of the Military Sealift Command.

FUTURE RESEARCH FOR OTSR

Future research will benefit the ship-routing service by:

1. Improving the accuracy and extending the time range of the wind and sea forecasts derived from the PE output.
2. Improving the accuracy of the analog selection process. More precise initial route recommendations and track changes will be the result of the development of more accurate extended-time forecasts. This in turn will improve ETA prediction and scheduling of dockside activity, which is most important in connection with supertankers, liquified natural gas ships, and

container ships.

3. Providing OTSR with a more detailed description of the actual and forecast sea state than is now available from the singular ocean wave model. This is being done with the spectral ocean wave model which provides energy values from 12 different directions and 15 frequency bands, with periods up to 26 sec. It is based on the analyzed and forecast PE marine wind field and computed for approximately 1,200 grid points in the Pacific and 800 in the Atlantic. The spectral wave charts are available out to 72 hr. This information is not used directly for route determination for OTSR ships at the present time, but is expected to be in use by January 1975.
4. Further study on ship performance. While wave period information from spectral wave computations is expected to be more useful than the singular wave model, it points up the need for more research into ship speed curves as related to wave period as well as wave height.
5. Development of tactical ship routing. Because of military requirements, a tactical routing service, possibly similar to the present OTSR system, is expected to be developed. In a tactical routing system, the concept of what parameter is to be optimized for a given route will be based on military demands. Instead of wind and seas determining the optimum route, cloud cover or acoustic considerations may be the important environmental elements.

In conclusion, it should be mentioned that in any weather forecasting system, the greatest need is for accurate and timely weather observations. The current cooperative ships' observation program provides the basic data base for an extremely large area of the Northern Hemisphere. The more ships that send in synoptic surface weather reports, the more accurate will be the forecasts that are generated for these ships.

POSTVOYAGE ANALYSIS

The following brief postvoyage analyses are presented as examples of the current OTSR operation.

Ship A

Ship A, a standard merchant hull, sailed from Okinawa on February 22, 1974 (fig. 1), for the return transit to San Francisco. The objective for this time-chartered ship was a best weather - minimum time track.

The original route (fig. 2) sent to the ship was farther south and slightly longer--83 mi--than the GMTR,

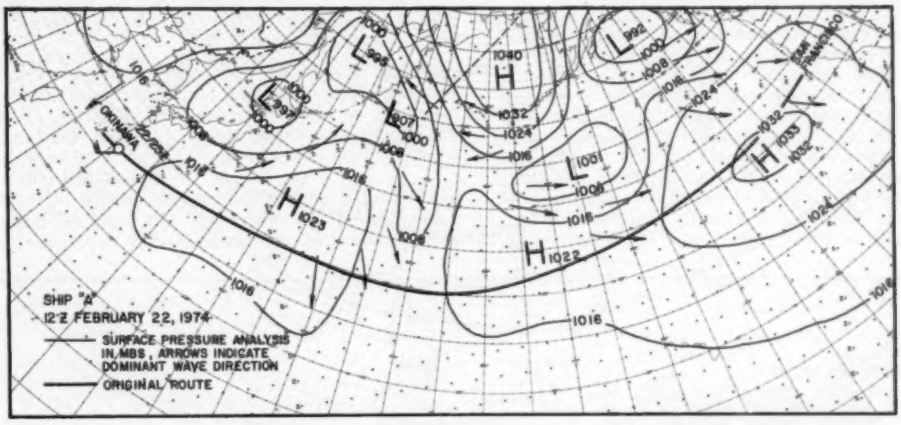

Figure 1.--Surface synoptic weather chart and original route of ship "A" at time of departure.

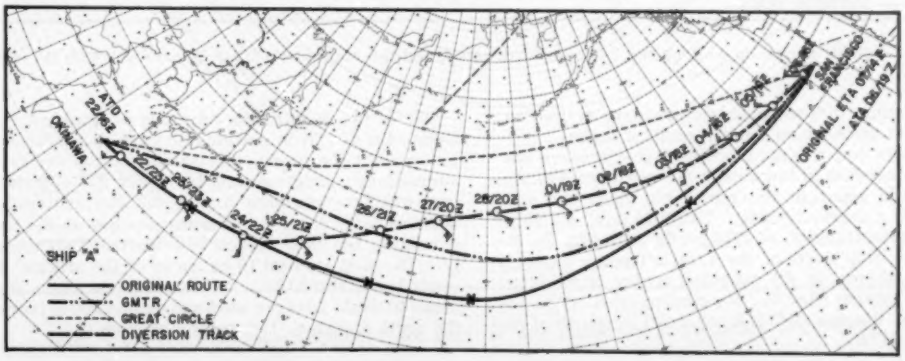

Figure 2.--Various tracks computed for the trans-Pacific voyage of ship "A".

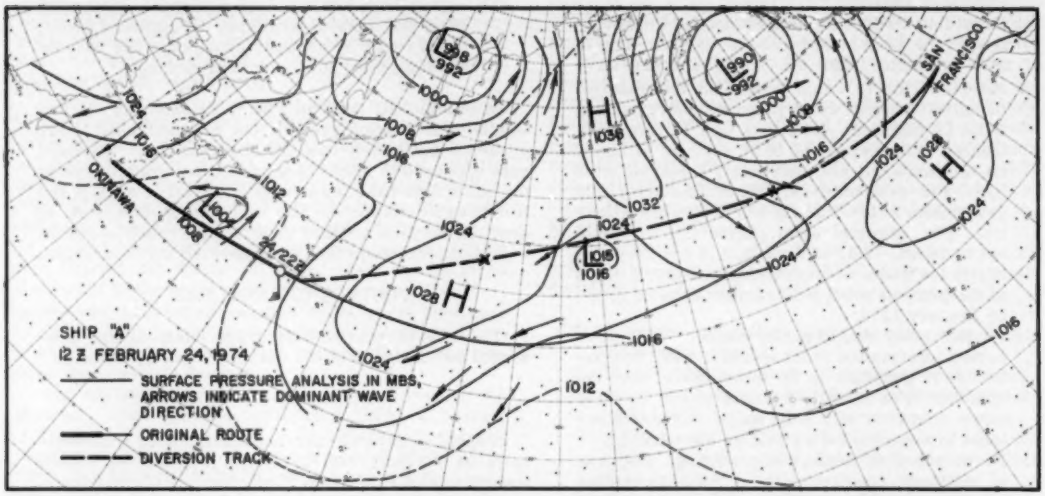

Figure 3.--Synoptic situation on the 24th when ship A was diverted north of its original track to avoid heavy seas to the south of a developing HIGH.

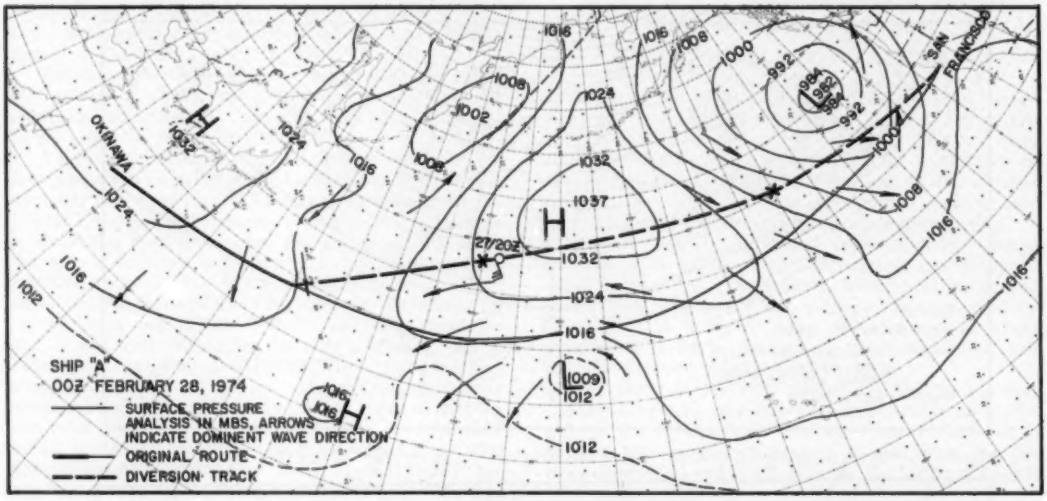

Figure 4.--HIGH shows up well on the 28th, as forecasted, and the ship's new track passes through its center.

mainly because a developing low-pressure system was forecast in the western Pacific south of Japan.

Two days out, a large blocking high-pressure systme was forecast to form over the northern Pacific, which would generate heavy easterly winds and seas on ship A's original route. To avoid this, the ship-routing meteorologist, at 2030 on the 24th (fig. 3), diverted the ship north of the forecast heavy easterly seas and nearer to the expected center of the high-pressure system (fig. 4). As confirmation of the action taken, the new GMTR track was also north of the original GMTR.

While the actual ship was only a couple of hours behind the GMTR in getting into port, the information provided by the forecast products and the navigation-surveillance program was such that the objective of best weather-minimum time track was achieved. In addition to avoiding the adverse weather on the original route, the ship's track was shortened significantly. The ship arrived 19 hr ahead of the original ETA (table 1). It should be noted that in most cases diversions to avoid adverse wind and seas usually increase the route distance, rather than shorten it.

Table 1. -- Ship A: Standard Merchant Hull, 18.0 kt (Military Sealift Command Military Report Speed).

Track	Distance	Estimated Time Enroute (ETE)	Actual Time of Departure (ATD)	Estimated Time of Arrival (ETA)*	Actual Time of Arrival (ATA)	Estimated Average Speed*	Actual Average Speed
Original route	5595 mi	12.93 da	22/1612	07/1430		18.0 kt	
Original GMTR	5512 mi	12.76 da	22/1612	07/1026		18.0 kt	
Great Circle	5288 mi	12.24 da	22/1612	07/0545		18.0 kt	
Actual ship including diversion	5446 mi	12.13 da	22/1612		06/1918		18.7 kt

*Predeparture calculations.

Ship B

Ship B, a military hull, was expected to sail from San Francisco on April 1, 1974, for deployment to WestPac. Initially, the transit was to be a normal best weather-minimum time track without any special requirements. The track chosen was very close to the initial GMTR.

Prior to sailing, though, revised operational commitments dictated that she arrive off Yokohama as soon as feasible. To accommodate this requirement, a revised route (fig. 5) was issued that took the ship north basically on a Great Circle track between San Francisco and Yokohama. Included with this route recommendation was an extended forecast indicating that the ship could experience periods of heavy weather on this northern track (fig. 6). The GMTR determined at the ship's ETD still considered a rhumbline from San Francisco to Yokohama to be optimum for best weather, but longer in distance and time.

Two diversions (figs. 7-9) for track change were made in order to pass farther north of low pressure

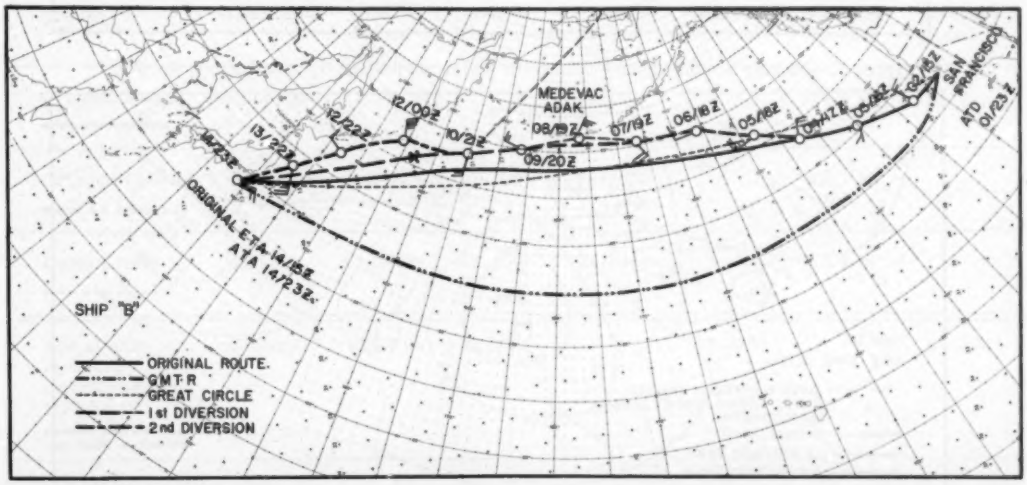

Figure 5.--Various routes computed for ship "B" and actual track, including diversions.

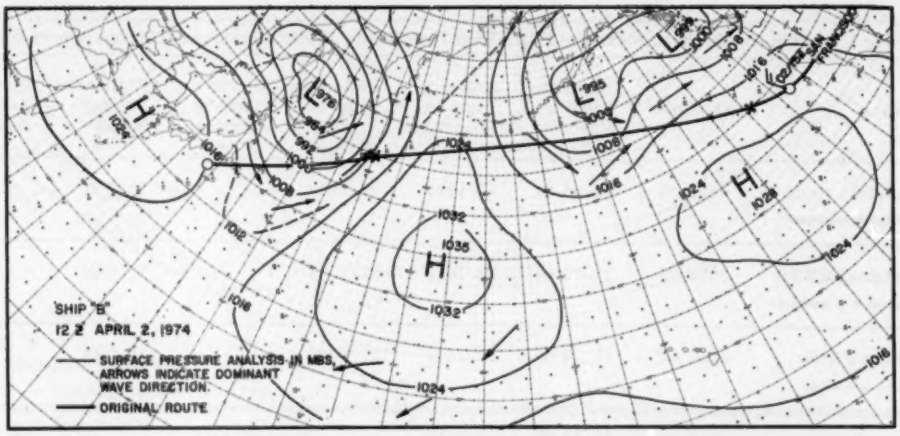

Figure 6.--Vessel is following original route and encountering 15-kt north-northwesterly winds about 1 day out.

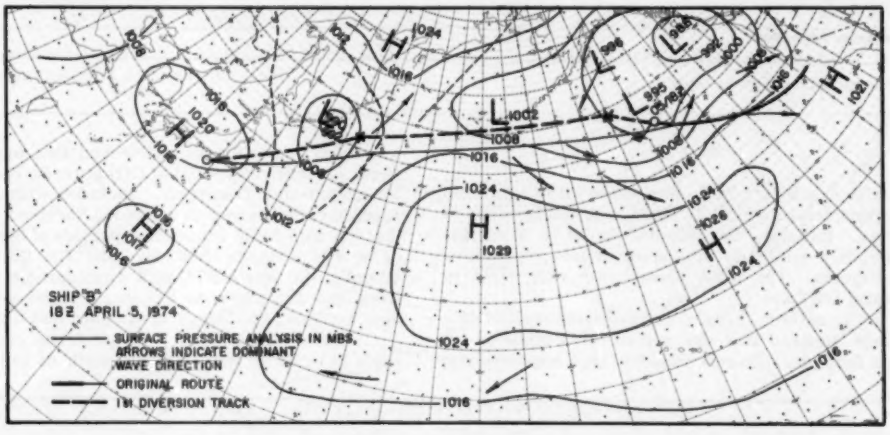
SHIP "S"
18 Z APRIL 5, 1974
SURFACE PRESSURE ANALYSIS IN MBS, ARROWS INDICATE DOMINANT WAVE DIRECTION
ORIGINAL ROUTE
1st DIVERSION TRACK

Figure 7.--Stormy weather ahead calls for a major northwesterly diversion on the 5th.

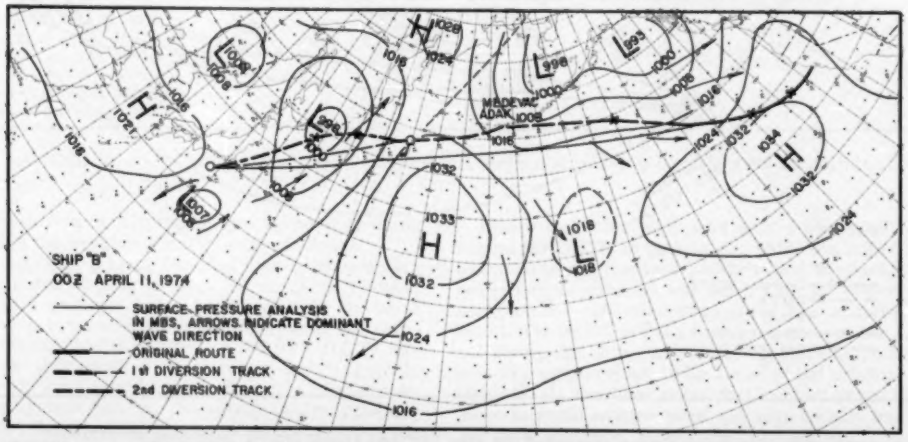

Figure 8.--After a small MEDEVAC diversion to Adak on the 8th, the ship makes its second major diversion on the 11th to avoid heavy weather south of a LOW off the Kuril Islands.

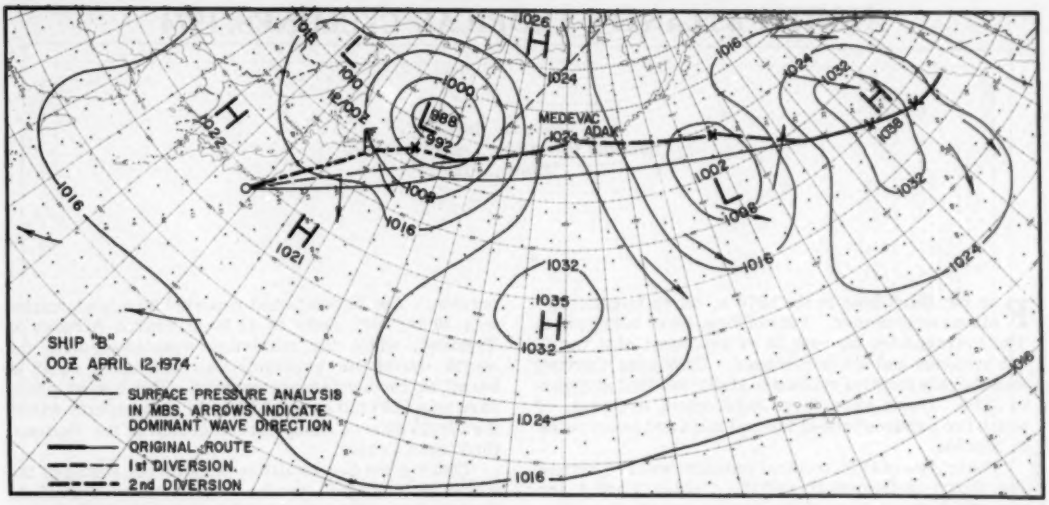

Figure 9.--Although the ship reported 35-kt winds on the 12th, they were considerably less than those that would have been encountered if the vessel had not been diverted.

systems in the northern Pacific. From the ship's synoptic reports this was successful with the highest winds and seas being encountered from a developing LOW in the area just south of Kamchatka.

It should be noted that a track change for a MEDEVAC at Adak was accomplished with little time lost for this unexpected emergency.

The ship arrived at its destination for operations only 7 hr behind its original northern route ETA. The GMTR ETA was 11 hr later than the ship's actual time of arrival, and does not consider any departure from track for the emergency MEDEVAC. See table 2 for a summary of the voyage.

Table 2.-- Ship B: Military Hull, 15.1 kt.

Track	Distance	Estimated Time Enroute (ETE)	Actual Time of Departure (ATD)	Estimated Time of Arrival (ETA)*	Actual Time of Arrival (ATA)	Estimated Average Speed*	Actual Average Speed
Original route	4604 mi	12.71 da	01/2300	14/1600		15.1 kt	
Original GMTR	4874 mi	13.45 da	01/2300	15/1000		15.1 kt	
Great Circle	4560 mi	12.58 da	01/2300	14/1300		15.1 kt	
Actual ship including diversions and MEDEVAC	4665 mi	13.00 da	01/2300		14/2300		14.2 kt

*Predeparture calculations.

NORTH ATLANTIC TROPICAL CYCLONES, 1974

John R. Hope
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Miami, Fla.

For the third time in the 1970's, seven tropical cyclones were named. Four of these were hurricanes. The averages for the past 30 yr are about nine tropical cyclones and six hurricanes. Hurricane Carmen was the only tropical cyclone to strike the United States in 1974. There were three subtropical cyclones, of which two produced above normal tides and heavy rains in Florida.

The tracks of 1974 tropical and subtropical cyclones are shown in figures 10 and 11. Tables 3 and 4 are statistical summaries of the two groups of storms.

Ship observations reporting gales (winds $\geq$ 34 kt) that were associated with the 1974 storms, and were used in preparing advisories and bulletins, are listed in table 5. The National Hurricane Center continues to value these ship observations, and considers them an indispensible part of the data network on which it bases its forecasts and warnings.

Tables 6 and 7 present tropical cyclone statistics for past years. Summaries of extratropical portions of the tropical and subtropical cyclones, if severe, can be found in the appropriate Smooth or Rough Log.

TROPICAL STORM ALMA, AUGUST 12-15

The initial tropical storm of the season developed unusually far south, reaching tropical storm intensity near 10°N, 52°W, on the 13th. Only one storm of record, occurring in 1933, crossed Trinidad farther south than did Alma.

After the storm center moved westward over Trinidad, it moved into northern Venezuela where its circulation was gradually destroyed by the mountainous terrain. The highest wind reported by a land station was 30 kt, with gusts to 42 kt at Piarco Airport on Trinidad, while the maximum associated with the storm during its existence was estimated at 55 kt based on reconnaissance reports. The lowest pressure was 1007 mb on the 13th. No ship reports within the circulation of Alma were received at the National Hurricane Center.

There were two fatalities as a direct result of the storm on Trinidad. On the Isle de Margarita off the Venezuelan coast, 47 persons perished when a passenger aircraft crashed as the leading edge of the rain shield associated with Alma passed over the Island.

HURRICANE BECKY, AUGUST 26-SEPTEMBER 2

Becky attained tropical storm status west of Bermuda near the longitude of 68°W, on the morning of the 28th, after having acquired a circulation several hundred miles north of Puerto Rico on the 26th. Hurricane strength was reached on the afternoon of the 28th

Table 4. --Summary of North Atlantic subtropical cyclone statistics, 1974.

No.	Dates	Maximum Sustained Winds (kt)	Lowest Pressure (mb)
1	June 25-27	60	1000
2	July 16-19	50	1005
3	Oct 3-8	50	1005

Table 3. --Summary of North Atlantic tropical cyclone statistics, 1974.

No.	Name		Dates	Maximum Sustained Winds (kt)	Lowest Pressure (mb)	U.S. Damage ($ Millions)	Deaths
1	Alma	(T)	Aug 12-15	55	1007		Trinidad - 2
2	Becky	(H)	Aug 26-Sept 2	100	977		
3	Carmen	(H)	Aug 29-Sept 10	130	928	90	U. S. - 1
4	Dolly	(T)	Sept 2-5	45	1005		
5	Elaine	(T)	Sept 4-13	60	1001		
6	Fifi	(H)	Sept 14-22	95	971		*Honduras - 3000-8000
7	Gertrude	(H)	Sept 28-Oct 3	65	999		

*The Red Cross has confirmed 3,000 fatalities up to this time in a continuing investigation. The Honduran Government estimates 8,000.

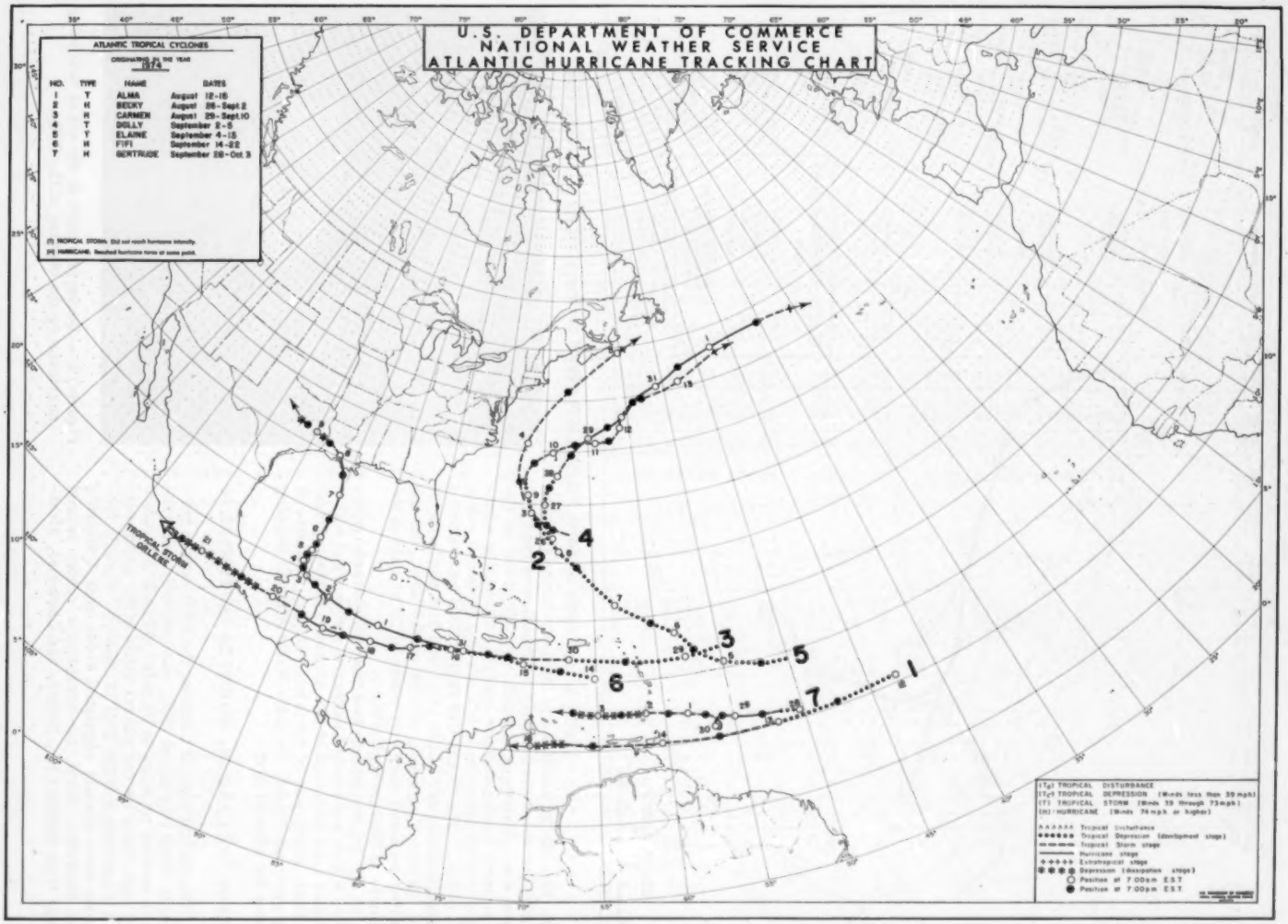

Figure 10. --Tracks of North Atlantic tropical cyclones, 1974.

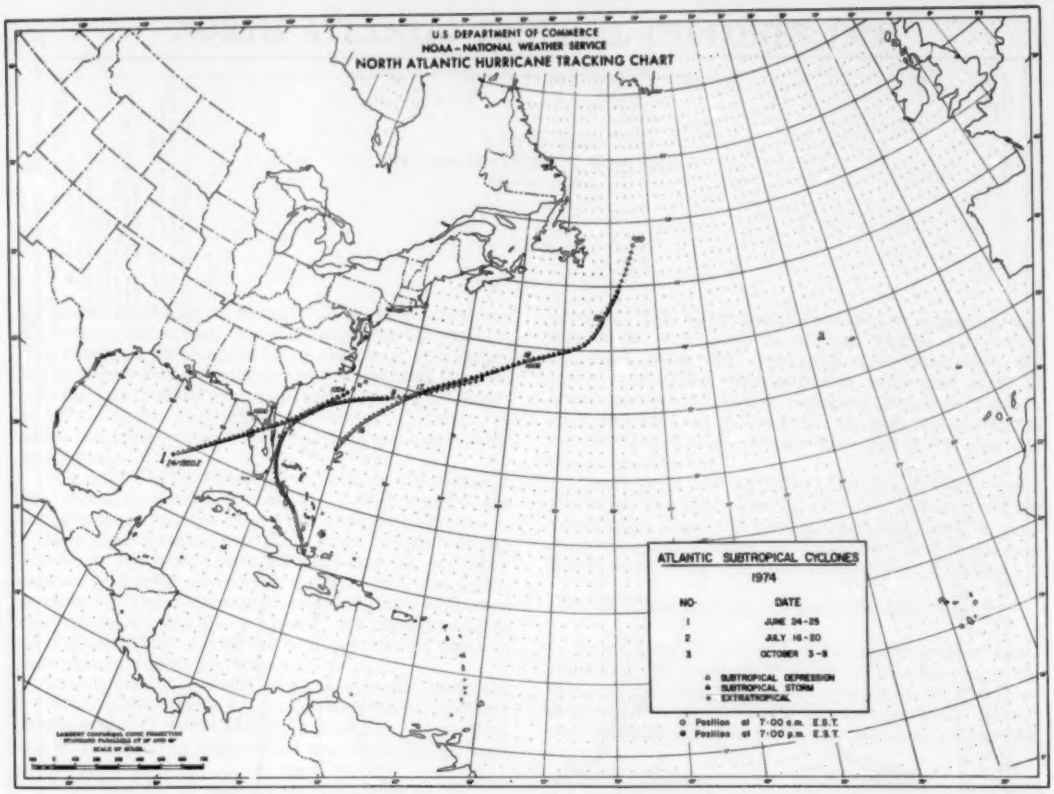

Figure 11.--Tracks of North Atlantic subtropical cyclones, 1974.

(fig. 12). Becky continued to intensify during the next 2 days as she moved slowly northeastward over the open sea. Maximum strength was observed on the 31st when reconnaissance reports indicated a minimum central pressure of 977 mb and sustained winds of 100 kt. The MANCHESTER ZEAL encountered westerly winds of 35 kt as it passed just southwest of the hurricane's center, at 1200 on the 30th, and the DEIDO reported southerly winds of 35 kt east of the center, at 0000 on September 1.

On the 2d, the system lost tropical characteristics after it had accelerated eastward and merged with a frontal zone northeast of the Azores. Never a threat to land, Becky was of concern to shipping because of its presence astride the main North Atlantic shipping lanes for several days.

HURRICANE CARMEN, AUGUST 29-SEPTEMBER 10

The central core of Carmen, the most severe hurricane since Camille of 1969, was evidently successfully avoided by ships in its path, although a number did experience its peripheral winds in the northwestern Caribbean and the Gulf of Mexico. Equally fortunate were densely populated areas near Carmen's two landfalls. First, the hurricane's center veered away from Belize City, Belize, and Chetumal, Mexi-

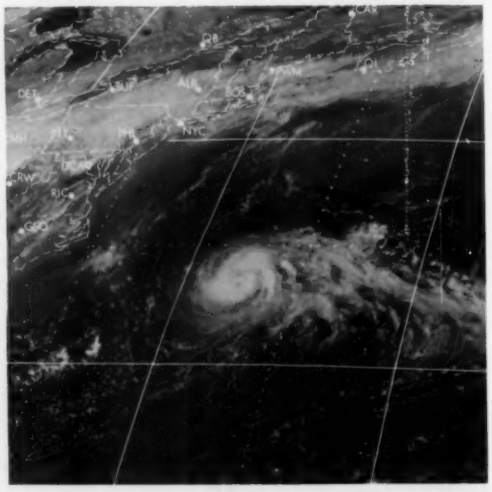

Figure 12.--Becky is caught in the act of becoming a hurricane on the evening of the 28th.

Table 5. --Ships encountering tropical and subtropical cyclones in the North Atlantic during 1974.

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C		Sea Waves*		Swell Waves	
			Lat. deg.	Long. deg.		Dir. 10's	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10's	Period sec.*	Height ft.
ALMA		AUG															
BECKY		AUG															
MANCHESTER ZEAL	BRITISH	30	38.0	62.0	12	29	35			1008.1			2	5		9	16
		SEPT															
DIDO	BRITISH	1	42.0	51.5	00	17	25			1016.6			7	7	21	9	15
CARMEN		AUG															
CHERRY VALLEY	AMERICAN	30	16.7	68.8	12	07	40			1007.0			4	8	10		6
BREUGHEL	BELGIAN	31	19.0	70.2	12	09	35			1009.2			8	7	09	8	10
MARIMUNDA	LIBERIAN	31	17.2	73.8	18	12	35			1010.0							
		SEPT															
SHIP		2	17.2	85.5	03	20	40			1003.0			9	10	09	7	13
SHIP		6	25.0	68.5	12	15	40										
SHIP		7	28.5	90.7	03	17	40			1000.0							
ZOELLA LYKES	AMERICAN	7	28.0	91.5	06	07	40			1007.6			3	8	08	6	8
ZOELLA LYKES	AMERICAN	7	28.2	92.2	09	04	35			1005.1			3	8			
ALASKACORE	GERMAN	7	27.2	93.3	12	35	35			1004.9			7	10			
SHIP		7	29.6	93.8	12	01	35			1010.2				10			
GAMMAGAS	GERMAN	7	28.0	92.7	15	03	45			1004.0			4	13	20	7	13
EXXON JAMESTOWN	AMERICAN	7	26.5	93.6	15	34	35			1007.5			6	8	10	8	
SHIP		7	29.6	88.0	15	11	40			1007.5			4	13			
GAMMAGAS	GERMAN	7	29.6	93.0	18	02	45			1007.5			4	7	26	7	13
SHIP		7	29.5	97.4	15	12	35			1008.5			4	20			
SHIP		7	29.0	97.0	21	13	25			1007.1			5	15			
SHIP		8	27.2	95.6	08	35	25			1012.5			3	6	02	5	13
DOLLY		SEPT															
PHOENIX	LIBERIAN	4	36.0	65.0	19	19	40			1008.0			9		19	8	
RAFFAELLO	ITALIAN	5	30.0	68.5	00	32	45			1010.0			10	15			
ELAINE		SEPT															
RIO ORINOCO	LIBERIAN	9	26.0	68.0	18	13	33			1013.5				8	13	7	11
SAN MARCIAL	SPANISH	9	31.2	79.5	06	10	25			1013.2			2	7			
EXPORT AGENT	AMERICAN	10	33.5	71.5	00	18	35			1009.1			8	10	18	10	15
FIFI		SEPT															
USCGC GALLITAN	AMERICAN	16	15.5	74.5	06	11	40			1007.5			3	10			
NAESS SATURN	NORWEGIAN	16	15.5	76.5	18	11	40			1008.0			4	6	11	5	8
GULF FINS	BRITISH	17	16.5	79.5	06	07	40										
GULF FINS	BRITISH	17	17.6	78.3	18	11	35										
PHILINE	LIBERIAN	17	19.5	83.9	18	08	30			1006.5			4	7	08	9	7
JAMES LYKES	AMERICAN	17	16.5	81.3	19	27	25						5	8	29	7	8
ALMIRANTE	HONDURAN	18	17.0	84.2	12	04	30			994.9			3	8	09	6	8
BAYANO	BRITISH	19	20.5	87.0	12	07	35			1008.4			1	6	11	5	7
ALMIRANTE	HONDURAN	19	16.5	83.5	00	13	40			1006.5				16			17
BARRANCA	BRITISH	19	19.0	86.8	18	12	35			1008.0			5	8	11	6	11
BAYANO	BRITISH	19	19.3	86.8	21	10	35			1008.0			2	6	10	6	26
BARRANCA	BRITISH	20	19.3	86.3	00	11	35			1008.2			4	9	11	6	24
BAYANO	BRITISH	20	19.5	86.2	03	13	35			1008.2			2	5	13	9	15
BAYANO	BRITISH	20	17.2	86.4	12	12	35			1008.1			2	3	12	6	13
GERTRUDE		SEPT															
HOWARD W. BELL	LIBERIAN	29	11.7	31.7	03	07	35			1011.9			3	15	7	10	13
PALMA DEL MAR	SPANISH	30	12.7	35.0	00	00	40			1012.0			4	11			
SUBTROPICAL STORM #1		JUNE															
PLATTE	AMERICAN	25	30.5	79.0	18	29	40			1005.3			12	20			
BOSTON	AMERICAN	25	32.0	72.0	18	25	45			1005.0			5	15			
SHIP		26	32.5	73.2	00	23	30			1013.9			10	17	23	10	17
SUBTROPICAL STORM #2		JULY															
EXPORT ADVENTURER	AMERICAN	18	36.5	65.0	21	33	47			1005.7			6	10	24	9	10
SUBTROPICAL STORM #2		OCT															
SHIP		5	25.0	75.2	12	06	40			1011.6							
SHIP		5	27.8	73.6	18	04	45			1014.6			7	20	01	11	17
FORT CREVECOEUR	FRENCH	5	28.0	79.5	18	04	35			1013.0			6	10			
NEDER EEMS	DUTCH	5	25.0	80.0	18	04	35			1014.9							
TEXAS SUN	AMERICAN	6	25.5	80.2	00	01	30			1013.5			5	6	04	5	10
SHIP		6	27.2	75.5	00	06	00			1010.0			10	20	00	11	30
SOCONY VACUUM	AMERICAN	6	27.6	79.8	00	05	45			1015.9			8	15			
SHIP		6	26.0	78.2	00	03	40			1010.9			5	14	03	5	14
CHEVRON LIEGE	PANAMANIAN	6	22.0	77.0	12	05	35			1017.5			7	14	04	6	14
JACQUES CARTIER	FRENCH	6	21.0	78.2	12	04	35			1019.3			3	14			
ASLAUG	DANISH	6	27.2	79.8	18	03	40			1008.0							
SOCONY VACUUM	AMERICAN	6	29.5	80.2	18	04	35			1013.2			8	14	04	11	30
NEDER EEMS	DUTCH	6	30.2	79.5	18	05	40			1013.2			4	7	06	10	17
EXXON WASHINGTON	AMERICAN	6	32.3	77.2	18	05	35			1016.5			7	18	05	7	30
NEDER EEMS	DUTCH	7	28.0	80.0	00	06	40			1013.0			5	8	06	9	24
SOCONY VACUUM	AMERICAN	7	29.6	80.1	00	01	45			1012.5			8	24	03	9	37
SHIP		7	32.8	79.0	00	05	35			1017.9			8	14			
SHIP		7	32.1	78.3	00	09	35			1014.0			8	18	08	8	19
SOCONY VACUUM	AMERICAN	7	31.0	80.0	12	03	35			1011.5			8	14	04	9	24
CHEVRON LIEGE	PANAMANIAN	7	34.0	80.8	12	10	35			1013.5			6	18	03	8	19
MOBILE AERO	AMERICAN	7	30.2	79.8	18	03	40			1008.5			4	7	01	8	30
DELAWARE GETTY	AMERICAN	8	30.0	80.2	00	32	40			1010.5			2	15	02	8	19
EXXON JAMESTOWN	AMERICAN	8	32.0	75.5	00	17	25			1008.9			4	10			
TEXAS SUN	AMERICAN	8	32.1	74.5	12	01	40			1016.2							
COLUMBUS AUSTRALIA	GERMAN	8	33.0	75.0	18	35	40			1011.5			4	7			
SHIP		8	30.9	69.4	18	03	45			1015.0			7	7			

* Direction of sea waves same as wind direction.

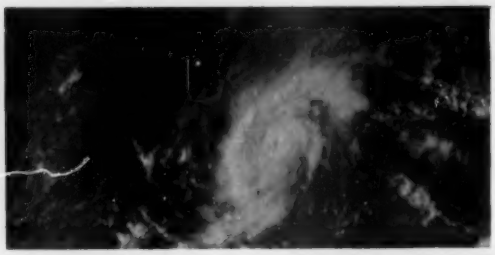

Figure 13. -- Carmen smothers Jamaica just after reaching hurricane strength, on the 31st.

co, crossing the coast in a sparsely populated area. After the weakened Carmen crossed the Yucatan Peninsula she regained strength as she moved northward across the Gulf of Mexico. However, the hurricane turned toward the northwest as it reached the Louisiana coast south of New Orleans, sparing that city from considerable damage.

The forerunner of Carmen was an easterly wave, which moved off the African coast on the 23d, and became a depression centered about 180 mi east of Guadeloupe on the 29th. Intensifying gradually as it moved across the Leeward Islands into the eastern Caribbean, the depression deposited up to 5 in of rain in the Virgin and Leeward Islands, and over 5 in on some sections of Puerto Rico.

Carmen acquired tropical storm strength south of the Mona Passage on August 30, as it moved westward about 80 mi south of Puerto Rico and Hispaniola, and it became a hurricane the following morning just south of Jamaica (fig. 13). The center passed a short distance north of Isle de Cisne (Swan Island) on September 1 (fig. 14), where gales blew for 4 hr; highest

Figure 14. --Judy meets Carmen. Navy pilot Lt. Judy Neuffer, in a Navy Hurricane Hunter WP3, became the first woman to pilot a plane through the eye of a hurricane on September 1. Wide World Photos.

Figure 15.--A member of the U.S. Coast Guard appears to be saluting but in fact is merely holding onto his hat as winds from hurricane Carmen kick up the waters of Lake Pontchartrain at New Orleans, La., on the 7th, just prior to the storm's landfall. Wide World Photo.

sustained winds reached 50 kt with gusts to 65 kt. As the hurricane center approached the Yucatan Peninsula on the 2d, with sustained winds of 130 kt and a minimum pressure of 928 mb, its course shifted toward the northwest, sparing Belize City and Corojal, Belize. Passing just north of Chetumal, Mexico, Carmen raked that city with 118-kt winds; minimum pressure there dropped to 956 mb. Although close to the eye of the hurricane, Chetumal was on its weaker side.

After moving inland over the Yucatan Peninsula, Carmen weakened and it was not until the 5th that she regained hurricane strength on a northward path across the Gulf of Mexico. Reconnaissance reports indicated that maximum sustained winds of 130 kt blew around a central pressure of 937 mb over the northern Gulf of Mexico (fig. 15). However, some weakening occurred just before landfall as cool air entered the system. Rapid weakening followed landfall on the Louisiana coast. The highest sustained wind measured over Louisiana was 75 kt. Rainfall amounts over land were generally 6 in or less. Reported storm tides ranged up to 6 ft along the Louisiana coast (fig. 16).

The first ship to report gale-force winds associated with Carmen was the CHERRY VALLEY as it passed just east of the developing storm's center on the morning of August 30. On the following day the BREUGHEL and the MARIMUNDA encountered 35-kt winds as they came within Carmen's circulation just as she reached hurricane strength. Only one ship (unidentified) re-

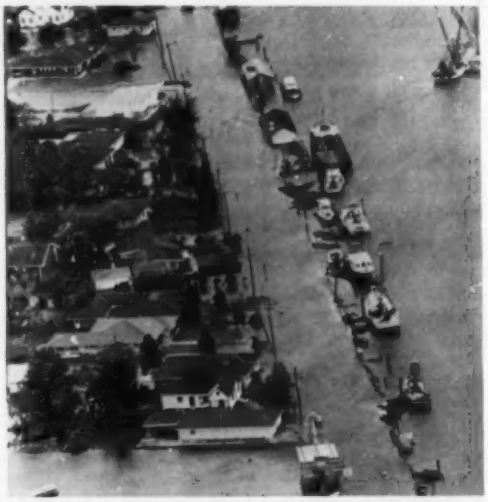

Figure 16.--Louisiana Highway 1 is open to boat traffic only after winds from hurricane Carmen drove waters over the levee that separated Bayou Lafourche from Golden Meadow, La., on Sunday the 8th. Wide World Photo.

Table 1

NORTH ATLANTIC TROPICAL CYCLONES FOR PAST YEARS

TOTAL NUMBER OF TROPICAL CYCLONES, LOSS OF LIFE AND DAMAGE

Year	Total Number Tropical Cyclones*		Total Number Hurricanes		Loss of Life		Damage by Categories**	
	All Areas	Reaching U.S. Coast	All Areas	Reaching U.S. Coast	Total All Areas	United States	Total All Areas	United States
1931	9	3	8	0		0		
1932	11	3	6	3		0		0
1933	21	7	9	5		63		4
1934	11	0	4	0		17		0
1935	6	2	3	2		411		1
	58	21	30	12				
1936	10	7	7	3		0		0
1937	9	4	5	0		0		0
1938	6	0	3	0		600		0
1939	6	3	3	1		0		0
1940	3	2	2	0		21		0
	40	21	20	4				
1941	6	4	4	0		10		0
1942	11	0	4	0	17	0	7	0
1943	10	4	6	1	10	10	7	7
1944	11	4	7	0	1,070	64	9	0
1945	11	3	6	0	19	7	9	0
	49	20	25	1				
1946	8	1	3	1	1	0	7	0
1947	9	4	6	2	73	60	9	0
1948	9	4	4	1	24	2	7	0
1949	10	3	5	1	9	7	7	0
1950	13	4	11	3	83	30	7	0
	50	16	32	12				
1951	10	1	8	0	211	0	7	0
1952	7	3	6	1	10	5	9	0
1953	14	0	8	0	3	0	7	0
1954	11	4	6	3	709	185	9	0
1955	13	0	9	3	1,000+	210	9	0
	54	12	37	9				
1956	9	3	4	1	10	21	7	0
1957	8	1	5	1	670	390	9	0
1958	16	7	7	6	49	0	7	0
1959	11	0	6	0	60	24	7	0
1960	7	3	3	0	105	65	7	0
	44	14	25	7				
1961	11	3	8	1	345	60	9	0
1962	5	1	2	0	6	4	9	0
1963	9	1	7	1	7,231+	11	9	0
1964	12	4	6	4	223	49	9	0
1965	6	2	4	1	93	75	9	0
	43	11	27	7				
1966	11	0	7	2	1,063	54	9	0
1967	9	0	6	1	63	15	9	0
1968	7	1	5	1	11	0	7	0
1969	12	0	10	2	324	256	9	0
1970	7	0	5	1	74	11	9	0
	46	1	33	7				
1971	12	5	8	3	64	5	9	0
1972	7	2	5	2	122	121	9	0
1973	7	1	6	0	15	3	9	0
1974	7	1	4	1	5,000+	1	9	0
Total	439	159	341	75				
Mean	9.0	3.2	6.8	1.5				

**The Environmental Data Service has for some time recognized that, without detailed expert appraisal of damage, all figures published are merely approximations. Since errors in dollar estimates vary in proportion of the total damage, storms are placed in categories varying from 1 to 9 as follows:

1 Less than $50
2 $50 to $500
3 $500 to $5,000
4 $5,000 to $50,000
5 $50,000 to $500,000
6 $500,000 to $5,000,000
7 $5,000,000 to $50,000,000
8 $50,000,000 to $500,000,000
9 $500,000,000 to $5,000,000,000

*Including hurricanes
+ Not reported in literature, believed minor.
• Additional deaths for which figures are not available.

ported gales on September 2, as the hurricane acquired its maximum strength before its first landfall--an indication that ships in its path gave wide berth to this severe hurricane. A number of ships reported gale-force winds in the Gulf of Mexico, mainly on the 7th; among them were the ZOELLA LYKES, ALASKACORE, GAMMAGAS, and EXXON JAMESTOWN.

Damage caused by hurricane Carmen in Puerto Rico was estimated in excess of $2 million, mainly in flash floods and in a tornado associated with the storm. In Louisiana damage was estimated at $90 million, primarily to the sugar cane crop, but some damage was sustained by offshore oil installations. Damage in Belize is believed to have been minor. There were no estimates of damage available from the Yucatan Peninsula of Mexico. The only fatality that was attributable directly to Carmen was an electrocution by fallen wires in Louisiana.

TROPICAL STORM DOLLY, SEPTEMBER 2-5

The cloud system that was to evolve into tropical storm Dolly was first evident on satellite pictures when it was located 700 mi east-southeast of Bermuda on August 30. Drifting northwestward for the next few days, the system became better organized and the development of a depression was confirmed on September 2 when the NEW ORLEANS reported southwesterly winds south of the developing center. On the following day the storm was named when a reconnaissance flight reported 45-kt winds and a surface pressure of 1005 mb. Southerly winds of 40 kt were reported by the PHOENIX east of the storm center on the 4th, and the RAFELLO experienced northwesterly winds of 45 kt the next day. Following tropical storm development, Dolly recurved to the northeast and lost its tropical structure when it merged with a cold front on the 5th. However, the remnants of Dolly later produced sustained northerly winds of 33 kt with gusts to 54 kt on Sable Island.

TROPICAL STORM ELAINE, SEPTEMBER 4-13

The convective cloud pattern which developed into Elaine was traced by satellite pictures from the African coast on August 30, to 600 mi east of the Leeward Islands on September 4, where a closed circulation was detected by reconnaissance aircraft. The storm was named during the late afternoon of the 9th, while centered 225 mi east-southeast of Cape Hatteras. Thereafter, Elaine moved northeastward, finally losing tropical characteristics as it neared a cold front 350 mi southeast of Cape Race, Newfoundland, on the 13th. No land areas were threatened by Elaine. Surface winds of 35 kt within the circulation of Elaine were reported, from the 8th through the 10th, by the RIO ORINOCO, the SAN MARCIAL, and the EXPORT AGENT. The lowest pressure measured in Elaine was 1001 mb on the 10th. Highest sustained winds were estimated at 60 kt. Some higher winds reported

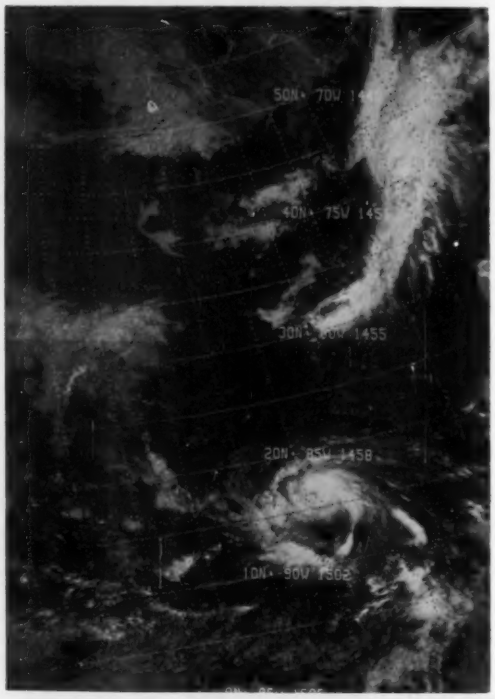

Figure 17. -- Hurricane Fifi skims along the coast of Honduras on her way to Belize on the 18th.

Figure 18.--The two photographs above show the damage which occurred when hurricane Fifi struck the Guatemalan coastal town of Puerto Barrios. Wide World Photo.

by reconnaissance aircraft are believed to have been transitory and not representative of the strength of the system.

HURRICANE FIFI, SEPTEMBER 14-22

Hurricane Fifi will be remembered chiefly because of the appalling loss of life in Honduras caused by inland flooding of rivers and streams. The influx of moist air from the Caribbean and the Pacific into the hurricane as it skirted the Honduran coast produced torrential rains up to 20 in or more in the mountains. In addition to drownings, many perished in mud slides as tilled slopes gave way and the avalanches buried all in their paths.

The precursor of Fifi moved off the African coast as an organized convective mass on the 8th. Moving steadily across the tropical Atlantic, it became a well-organized tropical depression on the 15th, south of Haiti, and a tropical storm on the 16th just south of Jamaica. Rapid strengthening continued, and Fifi became a hurricane 250 mi east of Isle de Cisne (Swan Island) on the 17th. The next day the hurricane acquired its maximum sustained winds of 95 kt (fig. 17). The lowest pressure of 971 mb was observed on the morning of September 19; however, slight weakening took place prior to landfall on the coast of southern Belize late that afternoon (figs. 18 and 19). Rapid weakening to storm and then to depression strength followed landfall. After crossing Belize and southern Mexico the system regained storm strength in the Pacific where it was renamed Orlene. Further strengthening to a hurricane occurred before making its final landfall on the west coast of Mexico.

Although Honduras received the brunt of Fifi's devastation, there were heavy rains in other areas. More than 8 in fell in 2 days over southern Jamaica. Heavy rain associated with the hurricane also fell over El Salvador, Guatemala, and southern Belize. Among the highest winds reported at land stations were 115

Figure 19.--Fifi's high tides and strong winds wrought destruction along the waterfront of Puerto Barrios, Guatemala. A resident tries to salvage some of his belongings. Wide World Photo.

kt on the Island of Guanja off the north coast of Honduras, and 85 kt at La Ceiba on the Honduran coast, 65 kt with gusts to 85 kt on Isle de Cisne (Swan Island), and 85 kt with gusts to 100 kt in southern Belize. Tides of 8 to 12 ft above normal were reported along the north coast of Honduras from Puerto Castilla westward to La Ceiba and Tela, and 10 to 12 ft along the coast of southern Belize.

Ship reports within the circulation of Fifi were more numerous than in any other named storm of 1974. The first was from the USCGC GALLITAN, located just north of the developing center, which reported 40-kt winds and 10-ft seas, at 0600 on the 16th. Nearly identical conditions were reported by the NAESS SATURN at 1800 that afternoon. Gale-force winds or higher were reported subsequently by the GULF FINN, PHILINE, JAMES LYKES, ALMIRANTE, BAYANO, and BARRANCA. Several of these vessels transmitted two or more reports as the storm moved westward, and were of significant help in tracking its course and in delineating the radius of its associated gale-force winds. The highest wind reported by a ship was 60 kt, observed by the PHILINE, at 1800 on the 17th, as it sailed eastward about 150 mi northwest of the hurricane's center.

HURRICANE GERTRUDE, SEPTEMBER 28-OCTOBER 3

The seventh named storm of the season developed from an Intertropical Convergence Zone disturbance which moved off the African coast on the 22d. On the 26th satellite pictures showed increasing organization and a depression formed by early morning of the 28th. Reconnaissance flights reported hurricane-force winds that afternoon. However, Gertrude never developed the characteristics of a well-organized hurricane. No wall cloud ever formed. The lowest pressure was 999 mb on the 28th. It was concluded that the hurricane-force winds observed were during bursts of short-period accelerations.

The HOWARD W. BELL reported 35-kt winds northeast of the storm's center at 0300 on the 29th. The PALMA DEL MAR encountered 40-kt winds, also northeast of the center, the following day. Weakening began on the 30th as satellite pictures showed the low-level circulation center separating from the main convective cloud mass. The system was downgraded to a tropical depression on October 2, just prior to reaching the Windward Islands. Its circulation disappeared over the southeast Caribbean on the following day. Locally heavy showers, well east of the remnants of Gertrude, continued over the Windward Islands through the 4th.

SUBTROPICAL CYCLONE NO. 1, JUNE 25-27

The development of the subtropical storm in the eastern Gulf of Mexico followed, by several days, the formation of a tropical depression off the Mexican

Table 1

NORTH ATLANTIC TROPICAL CYCLONES FOR PAST YEARS

Frequency of Tropical Cyclones (Including Hurricanes) by Months and Years

	Feb.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1931			1	1	2	2	1	1		9
1932		1			2	3	3	1		11
1933		1	1	3	7	5	3	1		21
1934		1	1	1	2	2	3	1		11
1935					3	1	2			6
1936			3	2	6	4	1			16
1937				1	2	6				9
1938					3	1	3	1		8
1939			1		1	1	3			6
1940		1			3	2	2			8
1941						4	2			6
1942					3	3	3	1		10
1943				1	2	4	3			10
1944				3	2	4	2			11
1945			1	1	4	3	3			11
1946			1	1	1	1	2			6
1947				1	2	3	3			9
1948		1		1	2	3	1	1		9
1949					3	7	2	1		13
1950					4	3	6			13
1951		1			3	4	2			10
1952	(Feb.) 1				2	2	2			7
1953		1			3	4	4	1	1	14
1954			1	1	2	4	1	1	1	11
1955				1	4	5	2			12
1956			1	1	1	4	1			8
1957			2		1	4	1			8
1958			1		4	4	1			10
1959		1	3	2	1	3	2			11
1960			1	2	1	3				7
1961				1		6	2	2		11
1962					2	2	1			5
1963				1	1	5	2			9
1964			1	1	4	4	1	1		12
1965			1		2	2	1			6
1966			1	4	1	4		1		11
1967					1	4	3			8
1968			3		1	2	1			7
1969				1	6	2	3	1		13
1970		1		2	1	3				7
1971				1	2	6	1	1		12
1972			1		2	1				4
1973				1	2	2	2			7
1974					2	4				
Totals	1	9	24	35	106	147	78	18	2	419

Frequency of Tropical Cyclones Reaching Hurricane Intensity by Months and Years

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1931					2				2
1932				3	1	1	1		6
1933		1	1	3	3	1			9
1934		1	1	1	1	1	1		6
1935				3	1	1			5
1936		1	1	3	2				7
1937					3				3
1938				3	1				3
1939				1		2			3
1940				3	1				4
1941					3	1			4
1942				3			1		4
1943			1	1	2	1			5
1944			2	1	3	1			7
1945		1		1	1	2			5
1946			1		1	1			3
1947				2	1	2			5
1948				1	3	1	1		6
1949				2	4	1			7
1950				4	3	4			11
1951	1			2	3	3			9
1952				3	2	2			6
1953				2	2	1			5
1954		1		2	3	1		1	8
1955				3	5	1			9
1956			1	1	1	1			4
1957		1			2				3
1958				3	3	1			7
1959		1	2		3	1			7
1960			1	1	2				4
1961			1		5	1	1		8
1962				1	1	1			3
1963			1		4	1			6
1964				2	3	1			6
1965				3	1	1			4
1966		1	3	1	1		1		7
1967				1	3	2			6
1968		2		1		1			4
1969				5	2	2	1		10
1970	1		1		1				3
1971				1	4				5
1972		1		1	1				3
1973			1	1	1	1			4
1974				2	2				
Totals	2	11	18	66	92	42	7	1	241

coast near Vera Cruz on June 22. By the evening of the 24th, the convective system associated with the tropical depression had weakened while convective cloudiness had increased and a new low center had formed in the eastern Gulf of Mexico. The new system moved northeastward at about 35 kt during the night of June 24-25, and crossed the Florida Peninsula on the morning of the 25th. Sustained winds of 30 to 40 kt, with gusts of 45 to 55 kt, were reported in the Fort Myers - Naples area as the system approached. Tides 2 to 4 ft above normal occurred from Everglades City to the Tampa Bay area. At midday on the 25th, after the storm moved over the Atlantic, east of Florida, reconnaissance aircraft and ships found a band of 45- to 60-kt winds about 150 mi wide, east of the storm center. As it moved northeastward during the 25th, the system weakened as it became frontal in character, and became difficult to identify by late evening.

Total rainfall from the storm and the tropical depression which crossed the coast 2 days later produced 20 in of rain in the Tampa Bay area and 10 in or more over much of West Central Florida. There were three deaths by drowning in Florida. Damage caused by tidal and heavy rainfall flooding has been estimated at $10 million in western Florida.

SUBTROPICAL CYCLONE NO. 2, JULY 16-19

Satellite pictures on the 15th suggested that a weak circulation was developing northeast of the Bahamas in an area of convective cloudiness which had been associated with a quasi-stationary front. The circulation became increasingly better organized as it moved northeastward through the 18th; however, the area covered by the circulation remained small throughout this time and there was no evidence from ship reports that supported satellite-picture indications of a significant weather disturbance until the EXPORT ADVENTURER encountered 47-kt winds and a pressure of 1006 mb at 2100 on the 18th. The ship's barogram and hourly weather reports between 2000 on the 18th and 0400 on the 19th were later made available to the National Hurricane Center. (See Letter to the Editor on page 322 of the September 1974 Mariners Weather Log.) These data show a closed circulation, and that the ship's barometer fell 18 mb in 6 hr. The LOW was absorbed into the circulation of a large extratropical low-pressure system off Newfoundland by the 20th.

SUBTROPICAL CYCLONE NO. 3, OCTOBER 3-8

There were indications of a LOW center forming over extreme eastern Cuba during the afternoon of the 3d. A cold front that had been moving southeastward across eastern Cuba became quasi-stationary that afternoon. An extensive area of cloudiness and rain persisted behind the front. A large high-pressure cell was centered over the middle Atlantic states, and the strong pressure gradient between the HIGH center and

the front was already producing northeasterly winds up to 30 kt over the eastern Gulf of Mexico, the Florida Straits, and over the Bahamas and adjacent waters.

The LOW was slow to organize during the next 2 days as it drifted northward, while the strong pressure gradient to the north and winds of near gale force persisted. By the afternoon of the 5th, as the LOW center moved into the central Bahamas, a number of ships reported winds in excess of gale force, including the TEXAS SUN, SOCONY VACUUM, and FORT CREVECOEUR. Winds of gale force and higher were reported also by land stations in the Bahamas during this time. As the storm moved slowly northward just off the Florida coast, ships continued to report winds in excess of 40 kt to the north of the center. At 1800 on the 6th, the ASLAUG and NEDER EEMS each reported 40-kt winds as did the NEDER EEMS and SOCONY VACUUM at 0000 on the 7th. Although the storm began to weaken as it moved northeastward away from the Florida coast during the afternoon of the 7th, the MOBIL AERO reported 40-kt winds at 1800, as did the DELAWARE GETTY at 0000 on the 8th. Additionally, the COLUMBUS AUSTRALIA reported 40-kt winds north of the front as the storm merged with a cold front 350 mi east of Cape Hatteras on the afternoon of the 8th.

The main effects of the storm were tidal flooding and beach erosion along the Florida east coast caused by the strong and persistent northeast winds, and some local flooding as a result of heavy rainfall. Tides ranged up to 3 ft above normal along portions of the Florida east coast. Rainfall amounts over a 3-day period included 10 in at Cocoa, 11.5 in at Deerfield Beach, and 14 in at Boca Raton.

WE OF NOAA ARE MAKING USE OF THIS SMALL AMOUNT OF SPACE TO EXTEND OUR THANKS TO ALL THE SHIPS' OFFICERS WHO ROUTINELY TAKE SHIPBOARD WEATHER OBSERVATIONS. TO US, THESE EXCELLENT OBSERVATIONS ARE PRICELESS, WE CERTAINLY DO APPRECIATE RECEIVING THEM ON A REGULAR BASIS.

GULF STREAM WALL BULLETIN

Diane Moravek and Bertrand Thompson
National Weather Service, NOAA
Silver Spring,. Md.

The National Weather Service (NWS) has recently initiated an experimental project for locating the Gulf Stream off the U. S. east coast from Florida to the mid-Atlantic states (38°N). The aim of this project is to develop a capability for providing mariners with routine depictions of the Gulf Stream from which they may estimate current velocities for routing purposes. Through analysis of satellite, ship sea-surface temperatures (SST), and bathythermograph data, the Weather Service expects to provide reliable all-weather analyses of the location of the Inner Wall of the Gulf Stream. Once having been informed of the location of the Inner Wall, mariners can approximate the band of high-speed currents which parallels the Wall and from which he can expect significant following currents when running northward. Likewise, the mariner can also determine the speed minimum, perhaps even a countercurrent, for use when running southward.

Until satellites began producing photos of the Gulf Stream routinely, a project of this nature was not possible. Surface and subsurface water temperature observations from conventional platforms, primarily ships, were just too scarce for the detailed analysis needed. Satellites are not an answer in themselves either, as atmospheric climatology and experiences with satellites over the past few years show that the Gulf Stream between Florida and Cape Hatteras is often obscured by cloud cover. Satellite photos, at times, show features that appear to be meanders or eddies, but may, in fact, be anomalies due to the presence of low-level atmospheric moisture, or only shallow sea-surface effects. Only by employing a mix of in situ and remote observations will the NWS be able to maintain a "fix," so to speak, on the Gulf Stream. All ships' SST's and bathythermograph reports are analyzed to determine the type of water mass from which they originate and their proximity to the

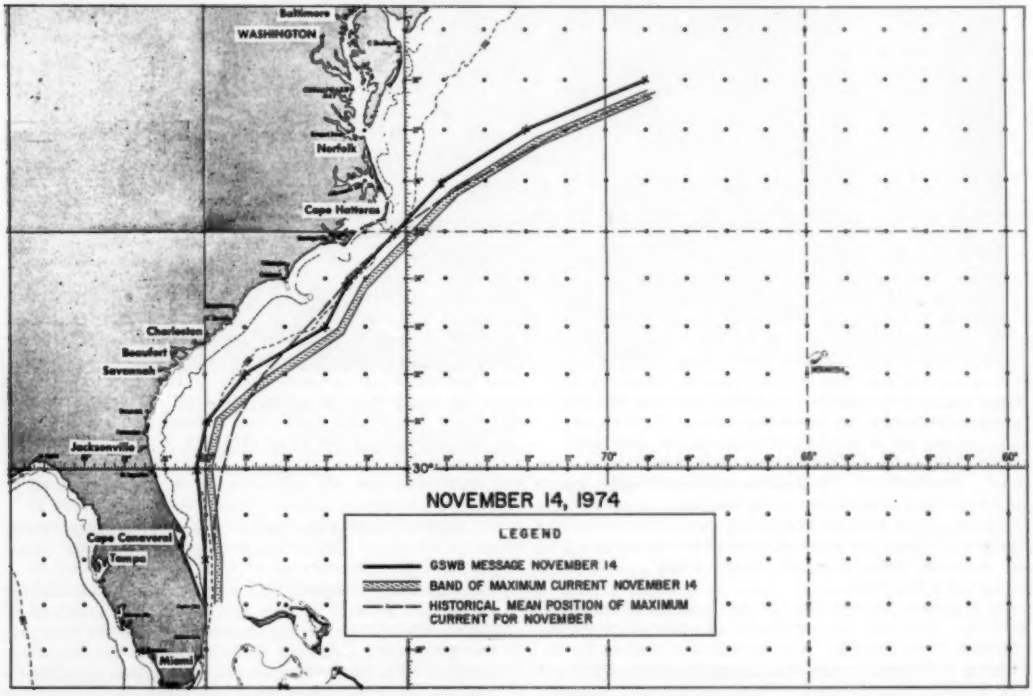

Figure 20.--Inner Wall of the Gulf Stream as plotted from GSWB message of November 14, 1974. Shaded area shows band of maximum current speed to the east of the Wall.

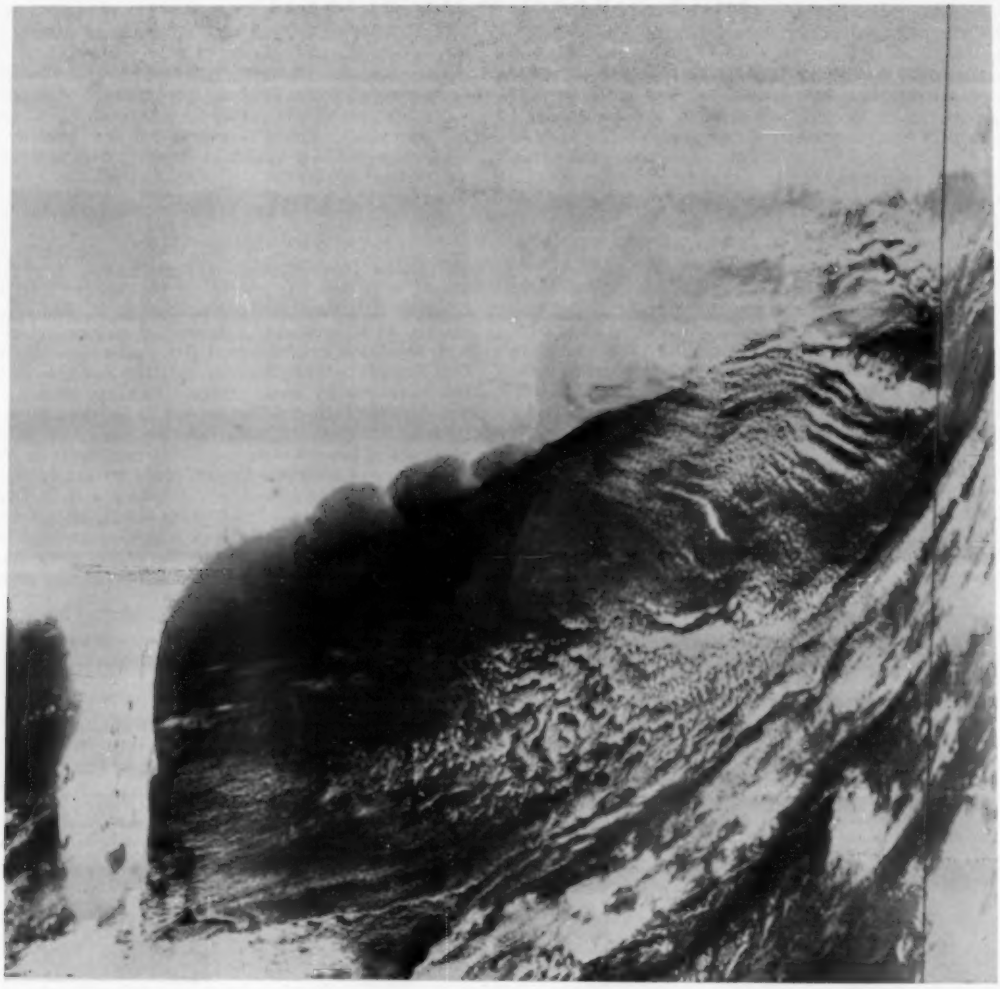

Figure 21. --This NOAA-3 infrared picture clearly outlines the Inner Wall of the Gulf Stream, particularly off Cape Hatteras, on November 14.

Inner Wall of the Gulf Stream. Data from buoys, aircraft, particularly the USCG monthly flights which gather Airborne Radiation Thermometer (ART) SST's from the Gulf Stream landward, and Ocean Weather Station HOTEL are examples of other inputs used by the National Meteorological Center (NMC) of the NWS in locating the Wall.

The NMC, assisted by the National Environmental Satellite Service, now produces an analysis of the Inner Wall twice weekly. A daily watch is kept on the incoming data and, if warranted, supplemental analyses are prepared and issued. The analyses are encoded in alphanumeric message format for dissemination to the shipping fleet. The following is a sample message:

GSWB 1114 A690 B720 C741 D753 E764 F770
G790 H800 I803 J801 K800 L801

The message begins with a four-letter identifying group GSWB (Gulf Stream Wall Bulletin), followed by the month and day group indicating when the analysis was prepared. Next are the latitude and longitude positions. The latitudes are predetermined and identified by letters. They progress from A = 38°N, B = 37°N, and so forth down to L = 27°N. The longitude of the Wall along the corresponding latitude is given

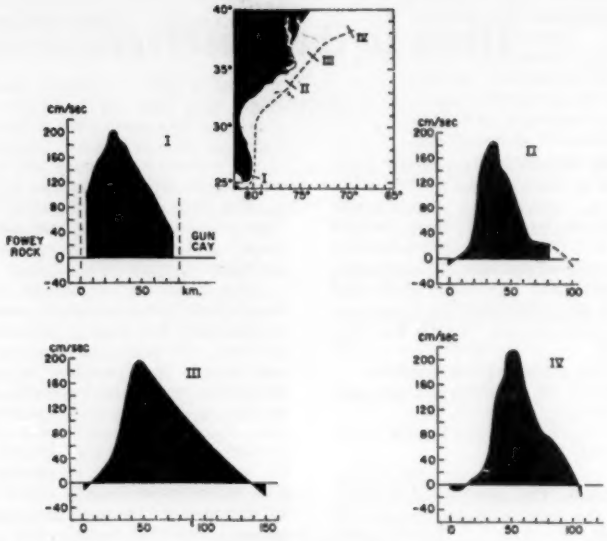

Figure 22.--Four cross-sections of the Gulf Stream showing distance of maximum current speed from the Inner Wall. Sections I and II by Webster (1961), section III TRIDENT cruise of July 26, 1965, and section IV by von Arx (1952). Reprinted by permission of UNESCO from Morning Review Lectures of the Second International Oceanographic Congress, UNESCO 1969.

in degrees and tenths. So, for example, A690 means the North Wall crosses 38°N at 69.0°W. The user can quickly plot these points on a map of the area and, by connecting points, obtain a picture of the approximate position of the Inner Wall of the Stream (fig. 20). It is difficult, if not altogether impossible, to determine the exact location of the maximum speed of the stream from satellite photos (fig. 21) and other oceanographic data. However, by studies and experience, it is known that the high current speeds occur between 12 and 25 mi (20 and 40 km) east of the Inner Wall. John A. Knauss, in a paper on transport of the Gulf Stream, given at the Second International Oceanographic Congress, cited geomagnetic electrokinetograph (GEK) observations taken across several locations of the Stream with corresponding cross sections showing that maximum speed did indeed occur in these cases at the expected distance from the Wall (fig. 22).

Using the general rule that significant northerly currents can be found 12 to 25 mi east of the line indicated on the GSWB message, a mariner can plot a band of maximum current (fig. 20) and determine his best time and fuel track, taking currents, as one of several factors, into account. Heading south, a master should remain west of the Wall or 50 mi or more to the east of it to reduce the opposing current, hopefully to zero, and even possibly to pick up a countercurrent.

Previous efforts involving the continuous measuring of water temperature at 200 m while enroute so that a transit could be made entirely within the Gulf Stream have proven to be somewhat misleading. In doing this, the maximum velocity of the Stream could be determined and in turn, the ship could follow the optimum course in respect to the highest current. However, obtaining the highest currents is not always the most desirable objective. The objectives are to spend less time at sea and to save fuel by sailing a minimum-distance track, encountering minimum opposing currents. The major drawback of the Stream-following method is simply that the Stream meanders too often and if one follows those meanders, increased track distance resulting in a loss in time could be experienced rather than the time and distance savings desired. It is for this reason that the mariner or ship routers must utilize the Gulf Stream Wall information as only one element in the course determination procedure. One can also see the advantage of being able to set a course at the outset of the transit rather than wandering as the Gulf Stream wanders. The much larger ships in use today simply can not react to such situations, for estimated times of arrival must be precisely forecast for economic and traffic reasons. With this new product in addition to the other parameters now used for routing ships, a savings in both fuel and time should be achieved.

Timely feedback from mariners, including oceanographic observations and statistics on savings, would be of great assistance to NMC in preparation of the analysis, particularly during cloudy periods. Comments on the Wall analysis and suggestions for other oceanographic products are invited by the NWS and should be sent to:

Director, National Weather Service
ATTN: Code W16
8060 13th Street
Silver Spring, Md. 20910

Hints to the Observer

CLOUDS

The ability to identify clouds and ascertain their altitudes can be an asset at sea or in port. The ability to correctly identify the types of low clouds could help in immediate shipboard operations, while proper identification of middle and high clouds may assist in foretelling future weather developments. Photographs of samples of low, middle, and high cloud types are included with each pad of Ship's Weather Observations (NOAA Form 72-1) to help observers identify the various cloud types.

A normal observation of clouds at sea involves:

1) the identification of all cloud types present (cols. 20, 22, and 23);
2) an estimation of the base of the lowest cloud in the sky (col. 21);
3) an estimation of the amount of sky covered by the lowest cloud (col. 19); and
4) an estimation of the amount of sky covered by all clouds (col. 8).

Total cloud amount, N (col. 8), represents the "big" picture and is an overall estimate of cloudiness without regard to cloud type or height. An easy way to estimate total cloud amount is to divide the sky into quadrants with two arcs at right angles to each other through the zenith. Each quadrant can then be estimated on the following scale:

0 = no clouds
1 = about half cloudy and half blue sky
2 = completely covered with clouds

The sum of these figures for the four quadrants then equals the total cloud amount in eighths of sky covered; the sum can be entered directly in the weather log.

The amount of low clouds, N_h (col. 19), represents the "small" picture and is usually an estimate of the predominant low cloud. When two low cloud types are present, the selection of which type to report for N_h can usually be simplified by reporting the amount of the more vertically developed clouds, i.e., cumulonimbus or cumulus rather than stratocumulus or stratus. N_h is the estimate of the cloud amount represented by the cloud type C_L, but, when C_L is not reported, the amount of C_M will be reported. An estimate of N_h can be made in a manner similar to the estimate for N, but higher clouds in the quadrant sums should be ignored.

From this discussion, it can be seen that these relations exist between N and N_h:

1) Estimates of both N and N_h can be made in a similar manner.
2) Reporting of both N and N_h is made in eighths of sky covered.
3) The amount reported for N_h is always equal to or less than the amount reported for N.

NOTE

Correction of the telephone number for Mr. Walter Sitarz, Port Meteorological Officer, Miami, Fla., as listed on page 375, November 1974 issue: change to 305-350-1333.

Tips to the Radio Officer

Warren D. Hight
National Weather Service, NOAA
Silver Spring, Md.

RCA STATIONS CANCEL SCHEDULED WEATHER BROADCASTS

The following RCA coastal stations have discontinued scheduled radiotelegraph broadcasts of marine weather information:

Radio WCC - Chatham, Mass.
Radio WOE - Lantana, Fla.
Radio KPH - San Francisco, Calif.
Radio KHK - Honolulu, Hawaii

These stations will transmit warnings upon receipt.

COAST GUARD RADIOTELETYPE COMMUNICATIONS WITH MERCHANT VESSELS

The following item was published by the Coast Guard in several recent Local Notices to Mariners:

Coast Guard Communications Station San Francisco recently implemented 66 WPM radioteletype capability for communications with merchant vessels so equipped. Merchant vessel/Coast Guard RATT circuits will be operated on an "on call" basis, with initial contact via AMVER frequencies or HF-SSB voice frequencies. Merchant vessels will transmit on their assigned ship frequencies, and COMMSTA San Francisco will transmit on assigned coast station frequencies.

CORRECTIONS TO PUBLICATION, WORLDWIDE MARINE WEATHER BROADCASTS

Page 12--Chatham, Mass. (WCC): The scheduled broadcasts at 0050, 1250, and 1650 GMT have been canceled. Warnings will be transmitted on receipt. Revise details accordingly.

Page 19--Ojus (Miami), Fla. (WOM): In the May 1974 Tips to the Radio Officer, new broadcast times of 0400 and 1200 GMT were added with the following set of frequencies given for the new broadcasts: 4428.6, 8792.8, 13137, 17325, 22688.5. The transmission mode was incorrectly noted as "A3A"; please correct to show that both sets of frequencies are "A3J" (single sideband).

Page 19--Lantana (Miami), Fla. (WOE): Delete the scheduled broadcasts at 0105 and 1305 GMT. Warnings will continue to be broadcast as stated.

Page 27--Portishead, United Kingdom (GKA, etc.): Mr. L. Toutenhoofd, Radio Officer on NEDLLOYD KIMBERLEY reports that only the GKA series of frequencies is used for broadcasting the weather bulletin. The selection of frequencies in that series depends on time of day and season of year.

Page 32--Scheveningen, Netherlands (PCH): Add to "area affected": "North Sea." Delete the following A1 broadcast times and related details: "0018, 0418, 1218, 1618, 2018." Change the times of the broadcasts on 421 kHz to read "0330, 0930, 1530, 2130." Change A3 frequency "1890" to read "1939." Change broadcast times "0835, 2035" to read "0940, 2140." Information supplied by Mr. Toutenhoofd.

Page 34--Dakar, Senegal (6VA): Mr. Stephen F. Haust, Radio Officer, EXPORT AMBASSADOR, points out that the "area affected" is not adequately described. The chart (fig. 23) below shows the exact forecast areas within the larger area. On this chart, areas A, B, C, & D are the designations used in plain language broadcasts whereas 101, 102, 103, and 104 are designators used in the coded MAFOR forecast.

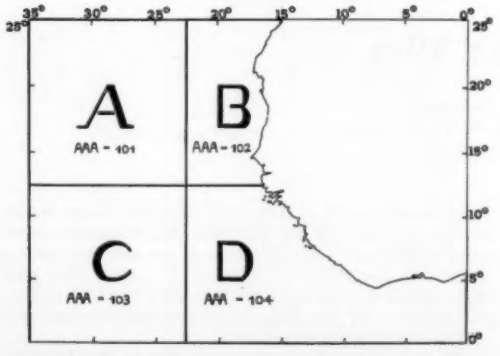

Figure 23. --Designated areas for Dakar, Senegal, forecasts.

Page 35--Mr. Toutenhoofd has also provided the following information on a marine weather bulletin transmitted by Rome Naval Radio/IDQ which he indicates is identical to the bulletin formerly broadcast by Malta Naval Radio. It is suggested that you enter the details in the vacant space on page 34.

Station: ROME, ITALY (IDQ)[1]
Area affected:[2] Mediterranean Sea

Call sign	Time of broadcast	Frequencies (kHz)	Class of emission
IDQ	0600,[3]	119.15	A1
	0930,[3]	2291[5]	A1
	1800,[4]	4280[5]	A1
	2130[4]	6390.3	A1
		8486[6]	A1
		12889.5[6]	

Time of broadcast	Contents of message
0600, 0930[2] 1800, 2130[2]	Warnings and forecasts

1 Naval broadcast schedules sometimes delayed due to naval traffic.
2 See figure 5, page 36
3 Rebroadcast of 0600 information
4 Rebroadcast of 1800 information
5 Used 1600 - 1700
6 Used 0700 - 1600
Note: The 0600 and 2130 broadcasts are often omitted

Page 43--Buenos Aires, Argentina (LSV): Delete all details relating to this radio station.

Page 56--San Francisco, Calif. (KPH): The scheduled broadcasts at 0500, 1700, and 2300 GMT have been canceled. Warnings will continue to be transmitted as noted. Revise details accordingly.

Page 60--Honolulu (Kahuku), Hawaii (KHK): The scheduled broadcasts at 0530 and 2030 GMT have been canceled. Warnings will continue to be transmitted as noted. Revise details accordingly.

Page 61--Honolulu, Hawaii (NMO): Effective December 1, 1974, this station added broadcasts which cover additional high seas areas. Please replace the old information with the following:

Station: HONOLULU, HAWAII (NMO)
Area affected:
(a) Hawaiian waters out 100 miles from the islands, including inter-island channels.
(b) Offshore waters within 1,000 miles of Hawaiian Islands.
(c) North Pacific, Equator - 50°N, 160°E - 140°W
South Pacific, Equator - 25°S, 160°E - 110°W

Call sign	Time of broadcast	Frequencies (kHz)	Class of emission	Power (kw)
NMO	0530, 2030	8650	A1	5
		12889.5	A1	5
	2030	17247.2	A1	5
	0500, 2000 H+18 or H+48	440	A1	5
	0545	6523.2[1]	A3J	5
		8762.2[1]	A3J	5
	1745	8762.2[1]	A3J	5
		13145.4[1]	A3J	5
	0000, 0300, 0600, 0900, 1200, 1500, 1800, 2100; On receipt	2670	A3	5

Time of broadcast	Contents of message
0530, 2030	Gale / storm / hurricane or typhoon warnings and forecasts for area c.
0545, 1745	Same as 0530 and 2030.
0500, 2000	Part 1: Small craft/gale/storm/hurricane warnings for area a. Part 2: Gale/storm/hurricane warnings and forecasts for area b.
0000, 0300, 0600, 0900, 1200, 1500, 1800, 2100	Same as 0500 and 2000.
H+18 or H+48; On receipt[2]	Small craft/gale/storm/hurricane warnings

1 Assigned frequencies; carrier frequencies are 1.4 kHz below the assigned frequencies.
2 See introduction, page x, for information relative to transmission of warnings.

Page 68--San Miguel, Philippines (NPO): Amend frequencies to read:

4445	A1	5
10440.5	A1	5
12200	A1	5

1974 EDITION OF RADIO STATIONS ACCEPTING SHIPS' WEATHER OBSERVATIONS

The new edition of Radio Stations Accepting Ships' Weather Observations was mailed to all weather-reporting ships about December 1. This booklet formerly carried the title U.S. and Foreign Coastal Radio Stations Accepting Ships' Weather Observation Messages. If your ship's copy isn't delivered, you may obtain a copy from the National Weather Service Port Meteorological Office servicing the ship, or from:

NOAA Central Logistics Supply Center (ADF152)
619 Hardesty Street
Kansas City, Mo. 64124

CORRECTIONS TO 1974 EDITION OF RADIO STATIONS ACCEPTING SHIPS' WEATHER OBSERVATIONS

Page 13--VRN Hong Kong - As reported by Mr. Lawrence Flavin, Radio-Electronic Officer on the AMERICAN LANCER, the following frequencies should be added: 8619 (0000-1300) 17192 (0000-0700). Add a note that the VRN frequencies are secondary to the VPS set of frequencies and are available during heavy traffic periods.

ACKNOWLEDGEMENT OF CORRESPONDENCE

We appreciate the information supplied by Messrs. L. Toutenhoofd, Lawrence Flavin, and Stephen Haust as noted, and also comments received from Capt. J. Janus, Master of PRESIDENT MONROE, and Mr. Alan Van Sickle.

Hurricane Alley

Richard M. DeAngelis
Environmental Data Service, NOAA
Washington, D.C.

NORTH INDIAN OCEAN

October and November are usually the most active months in the North Indian Ocean tropical cyclone season. On the average there is one each month. However, this year, September has proven to be the most active month with two tropical storms.

September storms are extremely rare in the Arabian Sea; however, one popped up, on the 21st, near 16°N, 67°E. It moved north-northwestward and developed over the next several days. Satellite photographs indicated that it reached tropical storm intensity on the 22d. By the 23d (fig. 24), maximum winds were estimated at about 60 kt near the storm's center, which was located near 20°N, 65°E. After this peak the tropical storm turned northwestward and dissipated rapidly. By the 25th, it was hardly recognizable on the satellite photographs.

No sooner had the Arabian Sea storm died than another was spawned in the Bay of Bengal -- more familiar territory for September tropical cyclones. Cli-

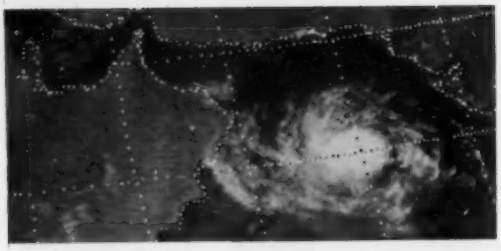

Figure 24. --A rare September Arabian Sea tropical cyclone.

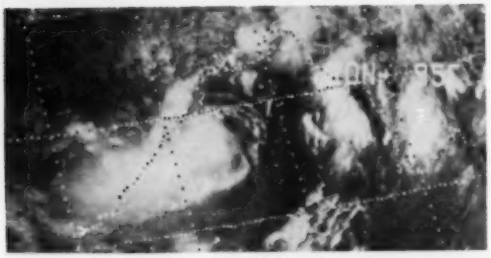

Figure 25. --The tropical cyclone is shown approaching the northeastern coast of India.

matologically these storms are confined to a rather narrow path -- one followed precisely by this storm. It developed, on the 26th, west of the Rangoon area of Burma. The tropical cyclone moved westward during the day, reaching tropical storm strength before crossing the 90th meridian. The following day, generating 50-kt winds near the center, the storm swung northward, just as climatology dictated it should. It was heading for the Mouths of the Ganges (fig. 25), but moved inland, on the 29th, south of Cuttack. Sandheads, just east of the center, was buffeted by 40-kt southeasterlies as the storm moved ashore.

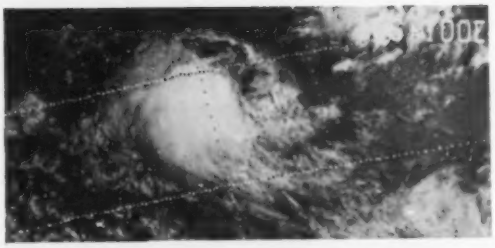

Figure 26. -- Tropical cyclone Marcie churns through the South Indian Ocean on the 19th.

SOUTH INDIAN OCEAN

September is a quiet month in the Southern Hemisphere. October is slightly more active. The first two storms of the season, Marcia and Norah, both came to life in October in the South Indian Ocean; this occurrence is rare, to say the least. Only three known October tropical cyclones have developed in these seas in the past 30 yr. Marcia developed, on the 18th, near 8°S, 88°E. The following day she was generating 45- to 50-kt winds near her center and moving southeastward at about 5 kt (fig. 26). On the 21st, Marcia passed about 120 mi southwest of the Cocos Islands, while she was turning southward. Winds on the Islands were light. The storm was already starting to dissipate. By the 22d, Marcia was a weak depression heading toward the 20th parallel near 96°E.

Norah formed, late in the month, in the extreme eastern waters of the South Indian Ocean. On the 30th, she reached tropical storm strength near 10°S, 97°E. On the 31st, winds climbed to 40 kt near Norah's center, which was passing about 120 mi northwest of the Cocos Islands. Norah turned westward on November 1. By late in the day, it was apparent that she was weakening. On the 2d, Norah was just a depression and fading fast.

Figure 27 shows the tracks of the Indian Ocean tropical cyclones for September and October 1974.

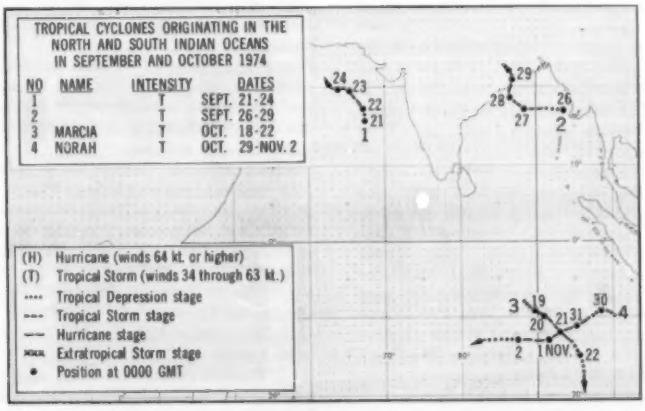
TROPICAL CYCLONES ORIGINATING IN THE NORTH AND SOUTH INDIAN OCEANS IN SEPTEMBER AND OCTOBER 1974
NO NAME INTENSITY DATES
1 T SEPT. 21-24
2 T SEPT. 26-29
3 MARCIA T OCT. 18-22
4 NORAH T OCT. 29-NOV. 2
(H) Hurricane (winds 64 kt. or higher)
(T) Tropical Storm (winds 34 through 63 kt.)
Tropical Depression stage
Tropical Storm stage
Hurricane stage
Extratropical Storm stage
Position at 0000 GMT
NOV.

Figure 27. --Tracks of Indian Ocean tropical cyclones.

SOUTHERN HEMISPHERE OUTLOOK FOR FEBRUARY AND MARCH

February and March, along with January, constitute the heart of the Southern Hemisphere tropical cyclone season. During this 2-mo period, in an average year, eight tropical cyclones, of which one or two are hurricanes, will develop in the South Pacific-Australia region, while in the South Indian Ocean six tropical cyclones, of which two will become hurricanes, would be normal.

In the South Pacific-Australia region, February and March tropical cyclones form over a broad area from 10° to 20°S between 115°E and 160°W. The general movement of these storms is toward the south and southeast. Off Western Australia in early February there is a tendency for storms that are paralleling the continent to recurve southeastward and move inland across the North West Cape. Late in the month, storms favor a more southwesterly path away from the mainland. Early and late in March, storms tend to form in the seas off the Northern Territory and move around and close to the coast. In mid-March they tend to remain off the coast.

On the eastern side of Australia, in the beginning of February, storms often form in the northern Coral Sea and move either southeastward past New Caledonia and into the open Pacific, or southward through the Coral and Tasman Seas recurving over New Zealand. Later in the month, there is a tendency for these Coral Sea storms to turn southwestward, threatening Queensland and New South Wales. An additional track lies near Samoa and runs from northwest to southeast; storms can form either northwest or northeast of Samoa. In early March, storms tend either to move parallel but off the east coast of Australia from the northern Coral Sea, or to move from the Solomon and New Hebrides Islands southward to New Zealand. Later in the month, these tracks become one that is centered north to south in the Coral Sea and there is also some activity around Samoa similar to that in February.

In the South Indian Ocean, February storms form all across the lower latitudes and in general move in a south to southwesterly direction recurving toward the southeast once past 30°S. The Mozambique Channel is threatened by tropical cyclones during this month. These storms usually move in from the northeast across the Malagasy Republic and then turn southeastward back to the open waters. There is also a chance that a February storm, particularly late in the month, will form in the Channel. Another favorite February path runs across the Mauritius, Rodriguez, and Reunion Islands. They move in from the northeast and are usually in the process of recurving southeastward; they pass closest late in the month on the average. A third average tropical cyclone track lies even farther to the east. This one also runs in a general parabolic curve from northeast to southeast; it affects the seas from 10° to 30°S between 70° and 90°E.

Storms are usually more concentrated in March. They often form in the seas near 10°S, 70°E, and travel west-southwestward recurving northwest of Mauritius and moving between these outlying islands (Mauritius, Rodriguez, and Reunion) and the Malagasy Republic, then heading southeastward into the subtropics.

On the Editor's Desk

GREAT LAKES ICEBREAKER OPERATIONS

The House Committee on Merchant Marine and Fisheries has favorably reported a bill which, through its anticipated effect of boosting the efficiency of Great Lakes icebreaking operations, would represent a step forward in establishing year-round navigation on the Great Lakes-St. Lawrence waterway. The proposed legislation would authorize the U. S. Coast Guard, in accord with international agreements, to conduct icebreaking activities in waters other than the high seas or those subject to U.S. jurisdiction.

Its immediate application would be felt on the Upper Great Lakes, where, for the past few years, the Coast Guard has been conducting, on an informal basis, a limited amount of exchange icebreaking with Canadian cutters. The Merchant Marine Committee's report on the proposed measure noted that the cooperative arrangements had "contributed to the efficiency of icebreaking operations associated with the interagency demonstration project to extend the navigation season on the Great Lakes and St. Lawrence Seaway." See article, "Great Lakes-St. Lawrence Seaway Navigation Season Extension," on page 135 of the May 1973 issue of the Mariners Weather Log.

According to the committee report, the areas of "operational reciprocity" which would be covered by the proposed icebreaking legislation include Georgian Bay and Thunder Bay on the Canadian side of the Lakes, and Buffalo, St. Clair River (Detroit-Port Huron), and the Duluth area on the United States side. Moreover, it stated that "depending on conditions, cooperative efforts would be launched in Lake Ontario and St. Lawrence Seaway proper."

The committee's report also explained that associated costs are expected to be negligible and may, with economies in operation made possible through international agreement, result in some savings. The savings can be realized because of the way the two countries' icebreakers could be dispersed at various points along the Lakes-Seaway system. As an example, if a U. S. cutter, at Point A, receives word to proceed to Point B for icebreaking operations, the operational costs of going to Point B can be eliminated if a Canadian cutter is already there to do the job, or vice versa.

Officials remarked that, due to its money-saving aspects, the cooperative icebreaking program would be worth instituting even if the extended-season factor were not involved.

Figure 28.--An aerial photograph of a sister ship of the ill-fated typhoon chaser.

54TH WRS LOSES WC-130 IN TYPHOON BESS

Search operations for a missing WC-130 (fig. 28) of the 54th Weather Reconnaissance Squadron were discontinued at 1:50 Wednesday, October 16 (Guam time). The aircraft, with six crewmen aboard, crashed in the South China Sea early Sunday morning (Guam time) while tracking typhoon Bess.

The extensive air-water search operation, which canvassed more than 6,000 sq mi, discovered a crash position indicator beeper of the type carried aboard the C-130. Searchers also located orange seat cushions and other debris. None of the crewmembers were found.

The aircraft took off from Clark AB, Philippines, about 0640, October 12, to gather weather data on typhoon Bess, which was churning through the South China Sea, south of Hong Kong. Last radio contact with the aircraft--a normal position report--was at 1400, October 12. The aircraft was about 400 mi north-northwest of Clark and 80 mi northeast of the storm center.

Aerial search operations Sunday were conducted by HC-130 rescue aircraft from Clark and Kadena AB, Japan. High seas prevented surface ships from entering the area.

The rescue planes reported spotting an orange seat cushion and hearing "two or possibly three" electronic pulsating beepers. (It was later learned that the erroneous reports of multiple beepers were the result of different aircraft fixes on the same device.) Rescue helicopters were standing by at Clark should survivors be spotted.

Throughout Sunday night, a lone C-130 orbited the accident area on an electronic night surveillance mission. At dawn Monday three HC-130s were dispatched to the site. Joining in the search were the USS WHITE PLAINS and HMS CHICHESTER. Amid calmer seas the WHITE PLAINS recovered the crash position indicator -- an air-foil device in the tail of the C-130 which is activated on impact or when submerged.

The search continued Monday night and throughout the day Tuesday before being discontinued.

SEA SLICKS MAY SAVE LIVES

A harmless manmade sea slick that is being studied as a hurricane suppressor may also help save lives another way, according to an oceanographer with the Environmental Research Laboratories' Atlantic Oceanographic and Meteorological Laboratories. It is believed that a slick-forming chemical, added to the dye packets of life jackets and rafts would make it easier for rescuers to spot shipwreck victims or others cast adrift at sea.

Certain chemicals form temporary sea slicks on the surface of the ocean, covering the water with a thin, polymer membrane only a few molecules thick. A small amount of one such compound--polyvinyl alcohol, lineoleic acid, and derivatives of polyvinyl acetate--can produce an acre of slick in 20 min, with a clearly visible, stable boundary. The chemicals used have been found to be of low toxicity, and the amounts involved are too small to harm aquatic life.

Last year, two scientists with ERL's National Hurricane Research Laboratory and the Illinois Institute of Technology announced that such a slick could block one of the channels feeding hurricanes. (See "Possible Use of Monomolecular Films in Hurricane Abate-

ment," Mariners Weather Log, Vol. 17, No. 5, pp. 277-281.) Hurricanes draw their destructive force from evaporation-produced heat energy from the ocean's surface. After experiments in the Gulf Stream east of Miami, the scientists concluded that the chemical film could effectively suppress evaporation and waves, and, therefore, inhibit the development of storms. The manmade slicks produce a smoother-looking patch of water and even suppress the ripples on the bow wave of a ship.

This wave-suppressing property makes polymer sea slicks potential lifesavers. Many lifejackets and rafts carry dye packets used in an emergency to create a splotch of bright orange in the water -- which, however, is soon dissipated by waves. The ability of sea slicks to calm the seas would assist in prolonging the life of the dye patch. Two ounces of oleal alcohol will form a slick about 200 ft (60 m) in diameter that lasts for several hours. The slick is highly visible and can be detected by airborne radar. Adding such a substance to lifejacket dye packets could greatly improve the efficiency of search and rescue operations as all-weather searches could be conducted from high altitudes.

UNION GUNBOAT USS CAIRO MAY LIVE AGAIN

A sagging, decaying skeleton once the Union gunboat CAIRO (fig. 29) patiently awaits what the South detested a century ago--Reconstruction. The tangled wreckage of the CAIRO is being preserved at the Ingall's East Bank Division of Litton Industries, situated next to Coast Guard Station Pascagoula, for eventual reconstruction and display at the Vicksburg National Military Park.

The ill-fated gunship, named for Cairo, Ill., was one of seven ships built by James E. Eads of St. Louis, Mo., for use by the Union Army in river campaigns during the Civil War. It was launched and commissioned on January 16, 1862. Immediately after its commissioning, the CAIRO was assigned to action on the Tennessee River. Due to engine trouble she was prevented from participating at Ft. Henry.

During the seige of Vicksburg, the CAIRO proceeded up the Yazoo River to search for and destroy Confederate underwater mines in preparation for General Sherman's amphibious force. About 3 mi below Snyder's Bluff she was sent to the muddy river bottom in less than 12 min after a mine exploded under her bow. There was no loss of life. Union sailors removed her flagstaff and chimneys to conceal the CAIRO from Confederate forces.

The CAIRO remained at the bottom of the Yazoo River undisturbed for over 100 yr, existing in history only as a footnote as the first vessel-of-war to be sunk by an electrically detonated (torpedo) mine. The vessel was relocated in 1956, at which time the City of Vicksburg and Warren County, Miss., raised money to salvage the artifacts aboard the vessel. Some of these are now stored at Vicksburg National Military Park and others at the National Park Service Museum workshop in Springfield, Va. Later, in September 1960, the pilot house and one of the CAIRO's big guns (fig. 30) were raised.

The big adventure began on August 3, 1964. A dredge cleared away the silt that had accumulated,

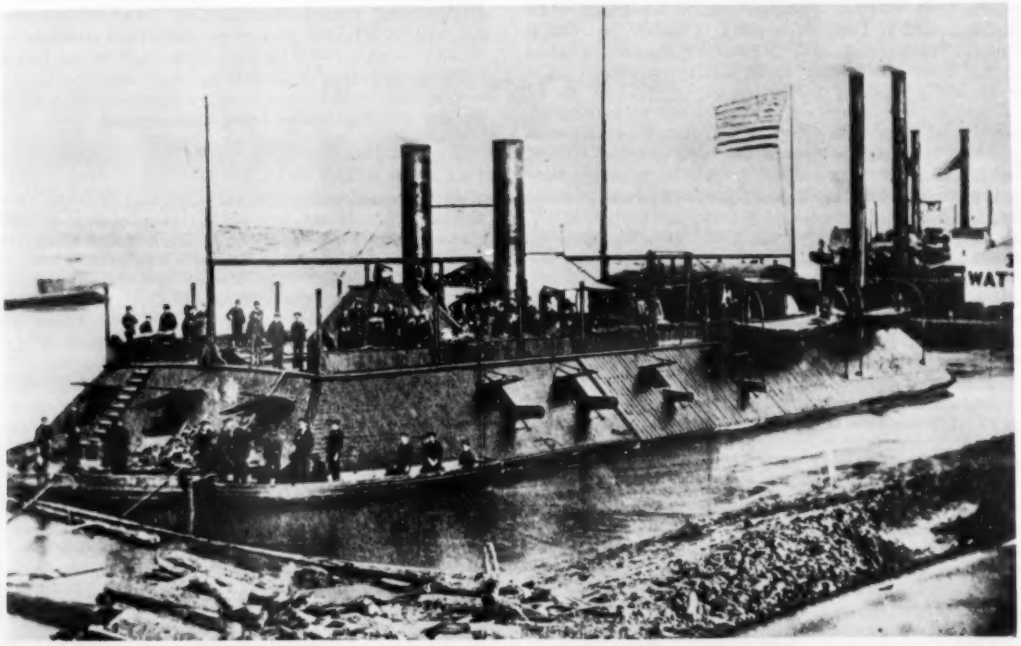

Figure 29.--An historic photograph of the gunboat CAIRO. Photographs and item courtesy of the Eighth Coast Guard District Octagon.

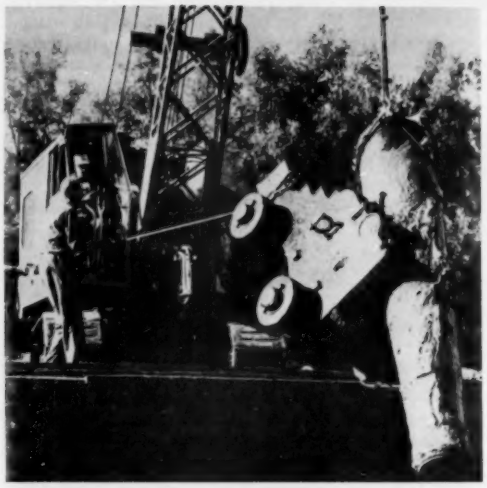

Figure 30.--This rust-covered, 32-lb naval gun was raised from the mud of the Yazoo River.

and a dragline dug a hole in the river bottom just ahead of the CAIRO's bow. Logs, some as much as 5 ft in diameter, had to be removed. Then the divers slowly seesawed huge cables (2 1/2 and 3 in diameters) under the hull. By October 17, seven of these cables were in position, and the next day the raising operation commenced.

Four derricks with a total lifting capacity of 1,000 tons pitted their strength against the deadweight of the big ironclad. They hauled her out of the hole into which she had settled, but even their combined power could not lift her out of the water. The thick iron armor, the waterlogged timbers, and the mud-filled holds were too much for them. They moved the vessel, still submerged, 70 ft upstream and set her down on a shoal.

New strategy was needed. A giant barge was towed to the scene and sunk in the hole the CAIRO had formerly occupied. On October 29, the derricks tugged on the old vessel once more. If they could get her on top of the sunken barge, the engineers felt they could raise both together without difficulty.

But nature refused to cooperate. Water in the Yazoo dropped to a low level. They had to work now or abandon the project. Cables strained, and the casement broke water. Just 6 in more and the CAIRO would slip easily onto the barge. Again the cables strained, and the hulk moved, but, without the buoyancy of the water to help support most of the vessel, the weight on the cables increased drastically. With a sickening noise, two of the cables cut deeply into the wooden hull.

All hope of raising the ship intact was gone. Now it was a question of saving as much of the historic vessel as possible. The professionals decided to cut the CAIRO into three sections: bow, midship, and stern. Finally on December 12, 1964, the derrick raised the last section and lowered it gently to the deck of the barge. It was 102 yr to the day since the

Figure 31.--The timbers of the bow section appear to have held up rather well considering that she was submerged for 102 yr.

gunboat had sunk.

After the salvage operations, it was found that the most preserved sections were a portion of the bow (fig. 31) housing three gun portals, three steam turbine engines, and the boiler and lead-lined gunpowder compartments. Sacks of charcoal, gunpowder, kitchen utensils, shoes, belts, cannons, and other armaments were all found intact on the vessel.

In an effort to begin restoration of the CAIRO, the hull was moved to Ingall's shipyard, where it has remained since, protected but unrestored. A retired Coast Guard commander was awarded the contract as total supervisor over the reconstruction of the gunboat, and is waiting patiently for government appropriations.

COUSTEAU TO HELP IN U.S.-SPONSORED MARINE RESEARCH

Capt. Jacques Yves Cousteau's famed research vessel CALYPSO will undertake a variety of oceanographic and weather experiments for NASA in cooperation with Texas A & M University. The experiments are part of Captain Cousteau's latest study of the ecology of the oceans, a broad exploration of the marine environment. The CALYPSO researchers plan to measure oceanographic features such as the chemical content of seawater, temperature, depth factors, water colors, and kinds and quantities of pollutants present in various regions.

The CALYPSO left Galveston, Tex., October 15 to begin a 9-mo voyage through the Gulf of Mexico, the

Caribbean Sea, and the eastern Pacific Ocean off Mexico and South America. Weather and oceanography experiments sponsored by NASA and Texas A & M will be carried out with the aid of orbiting satellites and flights over the CALYPSO by high-altitude aircraft such as the U-2.

Companion equipment designed to translate space-collected data quickly and efficiently into useable forms is carried aboard the floating laboratory, including satellite communications equipment and an Applications Technology Satellite-3 (ATS-3) surface terminal which permits daily contact with NASA's Goddard Space Flight Center, Greenbelt, Md., and Texas A & M, Houston. Four graduate students from the university will travel aboard the CALYPSO to assist with the onboard experiments, under the supervision of their professors.

The vessel also carries an Automatic Picture Transmission System (APT), an array of instruments that receives visual and infrared pictures from satellites continually, during the day and at night. The APT photographs aid in the scheduling of U-2 flights; the infrared capability of the system is used to measure ocean and weather conditions.

The U-2 will be carrying a Coastal Zone Color Sensor which is being developed for later flight on the Nimbus-G satellite scheduled for launch by NASA in 1978. The sensor is expected to be able to measure such factors as pollution, turbidity, chlorophyll content, salinity, and water temperature by correlating the subtle shades of color to actual conditions measured from the ship.

Another sensor, carried on the polar orbiting Nimbus-5 and Nimbus-F (to be launched next year), measures water content in clouds, rain rate, and liquid droplet size. Called an Electronic Scanning Microwave Radiometer, its readings will be measured against those taken under its track by the CALYPSO.

CALYPSO technicians plan to make use of a NASA-developed device called a "Scatter Meter," which samples seawater continuously as it flows through a special cell. A laser beam scans the cell and measures various angles of reflectance to detect organic and inorganic matter and contaminants.

The sophisticated equipment used in the CALYPSO studies and the synchronized approach--in which appraisals of weather and water conditions collected by satellites and high-flying U-2s can be measured against similar data collected by traditional means at the sea surface--is seen by scientists as an important evolutionary step toward fast and accurate assessments of significant aspects of ocean ecology.

For instance, the important ocean phenomenon called upwelling, in which nutrients are churned up to the surface by underwater currents, may be detectable by space photography. Upwelling often signifies the presence of plentiful quantities of fish, inasmuch as the feature acts as a trigger to increase the concentration of nutrients such as plankton, the sustenance of many small ocean creatures. The concentrations of small feeding fish at upwelling sites often attract larger ocean predators in commercial quantities. If a surface vessel such as the CALYPSO is able to verify the fishing circumstances as favorable, commercial fishing fleets could be quickly summoned to productive fishing grounds.

This approach was tested recently in a series of experiments completed through the cooperative efforts of NASA and the National Oceanic and Atmospheric Administration. Stocks of menhaden - a fish caught in enormous quantities and used for industrial purposes - were studied in the waters of Mississippi Sound, using remote air- and satellite-borne sensors. Locations of large schools of the fish were eventually correlated with readings of salinity, color, and transparency of ocean waters collected from space. Commercial fishing boats and surface research vessels confirmed the findings, and fishery scientists agreed that data obtained by space vehicles could be of inestimable value to commercial fishing fleets.

NEW MARINE WEATHER BROADCAST BY COAST GUARD

A new program of scheduled marine information broadcasts started on December 1, 1974. The broadcasts are transmitted from Coast Guard Group Commands at Humboldt Bay, Monterey, and San Francisco. They are made on Channel 22 (157.1 mHz) after a preliminary announcement on Channel 16 (156.8 mHz). Time schedules for the new broadcasts have been made available to boat owners through maritime publications. The broadcasts furnish mariners with important local weather and marine navigational information which is necessary for the safe operation of their vessels.

The broadcasting in the VHF-FM Band is due to the increased popularity of this mode of communications within the private and commercial boating public.

NEW SOVIET ICEBREAKER IN SERVICE

The Russian atomic icebreaker ARKTIKA, the flagship of a new generation of sea-going Russian atomic ships, has started sea trials from the Port of Leningrad.

The vessel, built at the Leningrad Shipyards, will be used on the Northern Sea route to convoy merchant ships through the areas of the Arctic that have been inaccessible up to now. The icebreaker, 140 m long with a beam of 30 m, is expected to prolong considerably the navigation season on the Northern Sea route, and to start a new stage in the economic and transport development of the north and its natural resources. (See "Sea Ice Part 3" in the Mariners Weather Log, Vol. 18, No. 4, page 219.)

The U.S.S.R. already has 15 yrs' experience in using atomic icebreakers with the LENIN. The ARKTIKA is a more powerful version of the LENIN, and has the world's first propeller unit using "double" current which gives extra thrust.

EB-33 LAUNCHED

A floating weather station was recently deployed in the Gulf of Alaska near Yakutat. Nicknamed "Nomad" (fig. 32), the 20-ft environmental buoy will monitor sea and surface-air conditions. The 6-mo deployment is part of a National Oceanic and Atmospheric Administration project to assess environmental conditions along the U.S. continental shelf. Of particular interest to the study are those areas proposed for future oil and gas leasing and exploration.

Figure 32.--The EB-33, Nomad, is being towed in Yakutat Bay prior to stationing in deep water farther offshore. U.S. Coast Guard Photo.

Deployment of the buoy was by the Juneau-based Coast Guard Cutter PLANETREE. The 180-ft buoy tender carried the 10-ton, all-aluminum device to Yakutat Bay. There, protected from heavy seasonal ocean swells, the buoy was placed in the water for towing to its station 90 mi south. It was anchored in water more than 2 mi deep.

The Gulf of Alaska is one of five areas being studied under this project. The study area is from Yakutat to Seward along the continental shelf and in deep waters as well. The Nomad buoy will measure environmental energies offshore to determine how they impact on the continental shelf area weather conditions. The data collected by EB-33, its official name, will be sent via radio to Coast Guard Radio Station, San Francisco. From there it will be relayed to project offices for processing and use.

In addition to the data collected by this new buoy, project scientists will acquire information from the larger, more sophisticated buoy EB-03. This 40-ft buoy was on station near the middle of the Gulf of Alaska for a year before being drydocked at Seattle. It was redeployed late this fall.

Other platforms to be used in this baseline study are the University of Alaska research vessel ACONA, three NOAA ships, a University of Washington vessel, and a commercial trawler which will be leased for fisheries research. The project is expected to be a continuing study, and several deployments of the Nomad buoy are planned.

The other geographic areas involved in the project are southern California, southern Texas, and northeast Gulf of Mexico, and the central Atlantic coast region. All have shown potential for oil and gas production.

LETTERS TO THE EDITOR

PRESIDENT MONROE INTERCEPTS SOS

The following letter was received from Captain John Janus of the American President Lines' PRESIDENT MONROE, enroute from San Francisco, Calif., to Yokohama, Japan, October 2 - 14, 1974.

"With reference to your Mariners Weather Log, September 1974, Volume 18, No. 5, page 319, Item; "CHINESE JUNK SETS SAIL FOR SOUTH AMERICA," we intercepted the following sad message, on 500 kHz at 090643.

'DDD SOS DE NMO
090613Z
THE VESSEL TAI KI IS SINKING POSIT 40-30N 169 W. 7 POB. VESSEL IS CHINESE JUNK BROWN IN COLOR. VESSEL MAY BE ABANDONED TO LIFERAFT. POSSIBLE CRT 3 SIGNALS ON 500/8364. VESSELS PROCEED AND ASSIST. ADVISE COURSE SPEED AND ETA BT
DE NOM VA'

"At that time we were over 1200 mi west of the stated position bound for Yokohama and did not receive any more messages as to the final search results. The 7 POB we interpret to read seven passengers on board."

Through Mr. Sam Raush, in the Port Meteorological Office, San Francisco, Calif., contact was made with the Coast Guard, and we were informed that the WASHINGTON MAIL picked up the crew from the TAI KI about 750 mi south of Adak Island and took them to Seattle. It was also stated that at that time the TAI KI was adrift somewhere in the Pacific.

The TAI KI departed Hong Kong on June 18, 1974, hoping to complete the voyage to South America in about 6 mo. She almost immediately ran into trouble as severe storms damaged her mast and rudder. Repairs were made in Taiwan. Marine worms attacked the 3-in-thick hull timbers, boring holes about one quarter inch in diameter. The worm damage plus a Pacific storm which left the TAI KI rudderless in 30-ft seas forced the crew to abandon the ship.

MARINE WEATHER REVIEW

Smooth Log, North Atlantic Weather

July and August 1974

The SMOOTH LOG (complete with cyclone tracks [figs. 35-38], climatological data from U.S. Ocean Buoys [table 8], and gale and wave tables 9 and 10), is a definitive report on average monthly weather systems, the primary storms which affected marine areas, and late-reported ship casualties for 2 mo. The ROUGH LOG is a preliminary account of the weather for 2 more recent months, prepared as soon as the necessary meteorological analyses and other data become available. For both the SMOOTH and ROUGH LOGS, storms are discussed during the month in which they first developed. Unless stated otherwise, all winds are sustained winds and not wind gusts.

SMOOTH LOG, JULY 1974--This was a quiet month. There were no tropical cyclones, and the majority of the extratropical cyclones were weak and shortlived. The total storm track pattern was shifted eastward of the climatological pattern. The most concentrated area was south and east of Nova Scotia and Newfoundland, between 35° to 50°N and 45° to 65°W. These were mainly frontal waves moving northeastward. The storm tracks in the northeastern Atlantic were spaced from the east coast of Greenland to across Scotland.

The overall sea-level pressure pattern matched climatology in the major features. The most prominent of these was the Bermuda-Azores High. It was centered near 40°N, 30°W at 1027 mb, or about 750 mi northeast of its mean position of 35°N, 44°W at 1024.6 mb. The climatic 1008.6-mb Low over Hudson Strait was matched by a 1009-mb Low. A significant difference in the pattern was a 1002-mb Low off Vestfjorden, Norway.

A minor perturbation in the pressure pattern had a major effect on the weather affecting shipping. This was a low-pressure trough that indented the Bermuda High. It extended southward from the Bay of Fundy and was associated with the frontal waves that traversed that area off the coast.

The largest anomaly was a minus 8-mb centered with the Low off the coast of Norway. The next largest was a positive 6-mb near Cape Finisterre. This positive area encompassed the area east of 40°W between 30°N and 50°N and extended into southern Europe, the Mediterranean, and North Africa. A negative 3-mb anomaly was centered near 40°N, 60°W. This was associated with the trough off the coast. Northern Greenland, Baffin Bay, the Labrador Sea, and the northern islands of Canada were an area of higher than normal pressure. As a matter of interest a negative 7-mb anomaly was centered near the North Pole.

The mean upper-air chart was near normal. The surface trough off the east coast of North America was reflected at 700 mb as was the Low over the Norwegian Sea.

The North Atlantic was no Titan this month. There was only one storm in which the winds reached 50 kt. Due to this, isolated wind reports will be mentioned without discussing the complete life of the system. At 0000 on the 2d, a cold front had moved over Nova Scotia and was approaching the drilling rig VGBZ, which reported 40-kt southwesterly winds.

On the 1st, a trough was analyzed west of Lake Winnipeg in the lee of the Rocky Mountains. By the 2d, a small closed LOW had formed and a frontal system developed. The Bermuda-Azores HIGH was well-developed and covered the eastern United States. With the development of the LOW the gradient over the Great Lakes and surrounding area tightened. At 0600, the J. L. MAUTHE, on southern Lake Michigan, measured 38-kt southwesterly winds. Later that morning, at 1200, the ENDERS M. VOORHEES, near Green Bay, measured 39-kt south-southwesterly winds. Within the last hour she had had a thundershower. The sea height was 10 ft. By the 3d, that LOW had dissipated and another developed over the Great Plains.

This was the storm with the highest winds for the month. On the 3d, a closed cyclonic circulation was analyzed near Anticosti Island in the Gulf of St. Lawrence. A weak east-west frontal system stretched from the Great Lakes to Ireland. Small waves were rippling along this front. At 0000 on the 4th, SEDCO I reported 35-kt winds as a frontal wave moved eastward.

As the LOW moved over water it started to deepen and, at 1200 on the 4th, was 989 mb and expanding its circulation. The TOPSDALSFJORD was near 49°N, 49.5°W with 35-kt gales, early on the 5th. By 1200 the LOW was 986 mb and had expanded north to Kap Farvel and south to 35°N. The drilling ship HAVDRILL, near 49.5°N, 51°W, had 40-kt winds and 21-ft seas from the northwest. The LABRADOR, north of Notre Dame Bay, and the TRADER, at 41.2°N, 49°W, reported 35-kt gales. The AMERICAN LEGEND, at 43.5°N, 36.9°W, had 40-kt gales with a rain shower at 1800.

The LOW was moving eastward very slowly along 50°N and still deepening. At 0000 on the 6th, the pressure was 978 mb near 49.7°N, 42°W. The EVPW just out of Trinity Bay was pounded by 50-kt winds. Only a few miles to the east the HAVDRILL radioed 45-kt gales and 25-ft seas.

At 1200 on the 6th, another 50-kt wind was reported. The previous report was west of the center while this report from the WESER EXPRESS near 45°N, 38°W, was almost 300 mi due south of the center. She also reported 12-ft seas and 21-ft swells. The AMERICAN LEGEND was at 42.8°N, 42.3°W with 40-kt winds, 12-ft seas, and 30-ft swells. The direction of the swell in both cases was from 250°. By 1800, she was being buffeted by 45-kt winds from the west-southwest. The seas were now 13 ft and the swells 15 ft from 310°. Winds of 35 kt were still being reported west of the center to the coast of Newfoundland. There had been no reports in the northern quadrant of the storm except Kap Farvel, which was reporting 25 to 35 kt. The facsimile "surface wind and sea analysis" indicated a large U-shaped area of 18-ft seas directly across the shipping lanes. The SEALAND VENTURE reported 20-ft seas, at 1200 on the 7th, at 45.9°N, 19.9°W.

On the 7th, there were reports of 35- and 40-kt gales south of the center, and the central pressure started rising as the storm turned northeastward. On the 8th, the strongest wind band appeared to have shifted to the southeastern and eastern quadrants. The NOVOMOSKOVSK reported 35-kt gales ahead of the front, near 48°N, 13°W. On the 10th, the LOW dissipated as the main circulation moved north of Scotland with a LOW that moved around the edge of this storm.

As the previous storm moved northeastward a small HIGH moved south-southeastward out of Labrador. The Bermuda HIGH was elongated east-west, with the appearance of a banana. Between the two HIGH's there was a similar shaped LOW. A center was apparent, at 1800 on the 8th, near 38°N, 61°W. It pushed southeastward as the Bermuda center moved westward. At 0000 on the 10th, the pressure was 1005 mb near 37°N, 53°W. The LASH ESPANA was near 40°N, 55°W and the CETRA COLUMBA was near 42.5°N, 45°W, both reporting 35-kt gales. The LOW had turned northeastward as it pushed against the Azores HIGH, and by 1200 on the 11th, it was absorbed by the circulation of a LOW moving up the St. Lawrence River valley.

A LOW was moving eastward out of Hudson Bay, on the 13th, with a trough to the east. At 1200, another LOW developed in the trough about 150 mi southeast of Kap Farvel. The NANOK S., just north of the center, was pounded by 35-kt winds and 16-ft seas. The LOW moved eastward on the 14th. At 1800, the MOSGULF, at 49.2°N, 23°W, measured 36-kt winds. At 0000 on the 15th, the 990-mb storm was approaching northern Ireland. The RUHR ORE, at 46.9°N, 20.5°W, had 36-kt winds and 16-ft seas. At 1800, the MARGARET LYKES was in the English Channel at 50.1°N, 00°, and was hit by 45-kt measured winds out of the south. Even in this confined area the seas were 10 ft. The LOW proceeded to cross the North Sea and destroy itself on the mountains of Norway.

These wind and wave reports are the consequences of two HIGHs rather than a LOW. The meteorological processes that led up to this condition started several days before.

A multiple cell HIGH combined into one at 1032 mb pressure, on the 15th, near 40°N, 35°W. It basically remained stationary in that area fluctuating slightly in pressure. At that time, a LOW moved out of Canada into Baffin Bay and the front moved off the U.S. east coast. Another HIGH from central Canada was pushing southeastward and building.

On the 17th, the two HIGHs were squeezing the front as it lay about 300 mi off the coast and frontal waves were rippling northeastward along it.

At 0000 on the 18th, one of these small waves (1014 mb) was near Cape Race. The Azores HIGH was 1035 mb near 43°N, 30°W. The Canadian HIGH at 1025 mb was centered over the Pennsylvania-New York border. Behind the front, near 41°N, 58.5°W, the ship plotted as EIOW reported 45-kt gales from the southwest. It also reported, or at least the plot indicated, swell code 55 (27.5 m/90 ft) from 250°. On the other side of the front, the HAHNENTOR's plot near 40°N, 54°W, indicated swell code 35 (17.5 m/57 ft) with only 20-kt winds. At 1200 the UHSP, near 43°N, 63°W, reported (data plotted-30020) 33-ft seas with a 5-kt wind, probably a swell report from 300° with a 10-sec period. These high wave reports are hard to believe with the meteorological situation, but there are too many to ignore. It was at 2000 that the EXPORT ADVENTURER encountered the sharp deep LOW at 39.6°N, 55.9°W. (See Letter to the Editor, page 322.) Far to the north on top of the HIGH, the UIZB was buffeted by 45-kt gales. This report was plotted with only 2-ft seas and no swell, at 0000 on the 18th.

Late on the 18th, one of the waves redeveloped or another developed near 57.5°N, 35°W. By 1200 on the 19th, it was a 990-mb tightly wound storm near 61°N, 26°W. The DRESDEN was at 57°N, 24°W, and caught in 40-kt gales. The LOW then moved south of Iceland and into the Norwegian Sea.

This LOW was born over Montana on the 15th. It moved over James Bay, on the 18th, and was over Nova Scotia on the 20th. At 0000 a ship reported a thunderstorm near Cape Sable and another ship off Cape Breton Island reported 40-kt winds. At 1200, the LASH TURKIYE, near 39.5°N, 61°W, was lashed by 40-kt southerly winds, 8-ft seas, and 12-ft swells. The 1001-mb LOW moved northeastward toward Newfoundland, and at 0000 on the 21st, SEDCO I measured 35-kt gales. The next report 24 hr later was still 35 kt, but the LOW was rapidly weakening, and, by 1200 on the 22d, a small HIGH was over the area.

The HIGH north of the Azores persisted in the vicinity of 40°N, 30°W, until the 28th, with pressures as high as 1037 mb. At that time it started to break down and move south of the Azores.

At 0000 on the 29th, the SEALAND CONSUMER was off Miami when she was hit by 48-kt northerly winds with a heavy thunderstorm.

Casualties--The 91,084-ton British bulk and oil carrier TYNE BRIDGE arrived at Seven Islands, on the 9th, with ice damage to the bulbous bow. The Liberian oil tanker ASIATIC (70,482 tons) was ripped by an explosion near Brest, France, and limped toward that port through 20-ft seas. The British submarine OPPORTUNE took off the injured and four passengers.

The barge BAUER ST 2 broke adrift from its moorings during a storm, on the 1st, and grounded with partial flooding. The Spanish trawler QUO VADIS

(538 tons) capsized and sank in heavy seas 60 mi north of Villa Cisneros, on the coast of Spanish Sahara, on the 30th.

SMOOTH LOG, AUGUST 1974--The cyclone tracks look more like a winter than summer month, in number. As usual they were mostly north of 45°N latitude. The track from central Canada across Hudson Bay was well traveled but farther west, turning northward west of Baffin Island instead of into Baffin Bay. The two primary tracks across the northern ocean were normally located. The northern most track extended from Labrador east-northeastward to south of Iceland, the other, from south of Newfoundland extended northeastward to south of Iceland, where the two converge. A secondary track then continues into the Norwegian Sea. The climatic primary track from south of Iceland eastward into Scandanavia was represented by one storm. Storms along and off the U. S. east coast were below normal.

The Bermuda-Azores High was the dominant feature of the pressure pattern. The 1024-mb center was 2 mb higher than the climatic mean and located slightly farther to the east near 34°N, 38°W. The ridge that normally extends eastward across Europe was better developed and up to 4 mb higher in pressure. A 1008-mb Low was normally located over Hudson Strait. The usual High over the Greenland Ice Cap was 5 mb higher at 1018 mb. The major difference in the low-pressure pattern was a 1005-mb Low centered south of Iceland near 60°N, 20°W. This reflected the convergence of the cyclone tracks in that area.

A large positive anomaly area extended from the eastern United States to eastern Europe. The Low south of Iceland resulted in a negative 5-mb anomaly centered south of its center. The higher pressure over northern Greenland produced a 6-mb positive anomaly over the Ice Cap, and also higher pressure over Baffin Bay.

The major difference from climatology in the upper-air pattern was a reflection of the surface Low south of Iceland. This produced a sharper trough west of 10°W. The heights of the pressure surfaces were higher than normal over Europe, across the central ocean centered on 30°N, and over the eastern United States. The trough that is normally located over the U.S. east coast was much farther west, over the Plains States.

Tropical storm Alma and hurricanes Becky and Carmen formed this month. They are described in the annual article, "Tropical Cyclones, North Atlantic, 1974," on page 8 of this issue.

A front, out of a LOW located south of Cape Chidley, moved off the North American Coast on the 1st. It moved steadily eastward as the LOW hung back. On the 1200 chart of the 3d, a new 1000-mb LOW formed on the front near 50.5°N, 33°W. This resulted in a tighter gradient south of the new center. The HORNGOLF, near 42.5°N, 31°W, was east of the front with 35-kt southerly winds. West of the front the UKJG was near 44°N, 44°W, with 40-kt westerly winds. The MAUMEE, near 59.9°N, 54.6°W, fought 40-kt easterly winds at 0000 on the 4th. The seas were 18 ft and the swells 20 ft. The LOW moved southeastward and then turned northward by 1200 on the 4th. The HANNOVER sailing eastward passed through the front with heavy rain as the wind shifted to the south on the east side. The LOW continued its northerly movement until it dissipated near Iceland, on the 7th, as the front disintegrated against high pressure over Europe.

On the 7th, a front laid across the U. S. east coast, near Norfolk. At 1200, a wave formed over the Chesapeake Bay and moved off in a northeasterly direction. It traveled steadily at about 1010 mb resulting in only light rain and wind shifts for ships along its path. It was not until the 11th that it started to intensify and was 998 mb by 1200.

At 0000 on the 12th, the 990-mb LOW was at 56°N, 22°W and headed northward. The GENE TREFETHEN was at 57°N, 24.5°W headed eastward. At that time she encountered roaring (for August) 50-kt winds from the northeast in the northwest quadrant of the storm. She was also battered by 20-ft seas and 16-ft swells. Twelve hours later she was still experiencing 35-kt gales in the northeast quadrant as the storm drifted slowly northeastward. Several ships reported waves of 15 ft southeast of the center.

The LOW stalled near 57°N, 21°W, and rapidly disintegrated as other LOWs approached from the southwest. This was the only LOW this month to form over the United States and move across most of the North Atlantic.

This small storm formed off the U.S. east coast, near 37.5°N, 71°W, at 1200 on the 10th. Its circulation expanded rapidly the first 12 hr. At 0000 on the 11th, Ocean Weather Station "H" was hit by 40-kt winds with 15-ft seas. To the south, 36.7°N, 73°W, the EXXON SAN FRANCISCO found 35-kt gales and 13-ft swells. The LOW used up some of its energy and appeared to weaken slightly, on the 12th, but the SEALAND VENTURE, near 40.5°N, 66.1°W, was hit by 41-kt winds. That day it curved back northwestward and then turned northeastward again on the 14th. During this time it took a swipe at the UNION SUNRISE with 35-kt winds. The MORMACSCAN reported a thunderstorm.

The LOW now continued to move northeastward off the coast as a small storm. At 1200 on the 15th, it was approaching St. Mary's Bay and VGBZ reported 35-kt gales. At 0000 on the 16th, SEDCO I was battered by 45-kt winds as the storm moved northwest of its position. Late on the 17th, the storm turned northward for 24 hr before continuing northeastward. No other gale reports were received, until 1200 on the 19th, when the SEATRAIN LOUISIANA found the 35-kt isotack near 52°N, 31°W at 1200 on the 19th. Along with this she had heavy drizzle, 10-ft seas, and 16-ft swells.

On the 20th, the LOW was south of Iceland and, by 1200 on the 21st, was to the east. A ship for which the call letters were not plotted radioed a report of 40-kt gales at 58°N, 23°W. This was to be the last report connected with this long-lived storm as it was absorbed by a Greenland Sea LOW on the 22d.

On the 21st, a col was located over the Labrador Sea south of Greenland. On the 22d, a LOW formed in that area and started moving eastward and expanding. At 1200 on the 23d, the LOW was near 58°N, 31°W, at 994 mb. Kap Farvel reported 35-kt summer winds of 37°F. The HILAIRE MAUREL, off Hamilton Inlet, reported 40-kt gales with 13-ft seas and swells.

By 1200 on the 24th, the 980-mb cyclone was south

of Iceland near 58°N, 27°W. The front had moved to the outer fringe of the circulation, and the stronger winds were reported near the front. Two 40-kt reports were plotted at that time; by the PORT MARLY ahead of the front near 49.3°N, 21.5°W, and the SEA-LAND VENTURE behind the front near 47°N, 32°W. As the storm center brushed the east coast of Iceland on the 25th, it reached its lowest pressure of 974 mb. The AMERICAN ARGOSY, at 52.9°N, 21.1°W, braved 40-kt winds. On the 26th, there were two reports of 40-kt gales, one by Ocean Station Vessel "I" and the other by a ship that was probably plotted at the wrong location. The storm moved northward into the Greenland Sea and treated the weather station at Dove Bay to 45-kt freezing winds. The storm could not withstand the cold climate as it expired on the 29th.

This storm developed off Cape Race, on the 25th, as a 1011-mb frontal wave. On the 26th, it absorbed a LOW that had moved out of Quebec and the system intensified. The VGBZ reported 50-kt winds in Cabot Strait. The LOW moved northeasterly and was 990 mb, on the 27th, near 56.5°N, 28°W. At 1200, the JOHN CABOT contended with 40-kt gales blowing 18-ft seas at 49°N, 23°W. Two other ships had 35-kt gales in the same general area. At 0000 on the 28th, the QUEEN ELIZABETH 2 was racing along with 40-kt winds on her stern. As the storm center moved over the George Bligh Banks, Ocean Station Vessel "J" measured 35-kt winds. On the 29th, the LOW suddenly started filling and by the 30th was gone.

Casualties--Weather casualties were light as would be expected in a summer month. The 16,988-ton Liberian registered LIPS collided with the 15,053-ton Korean HANYANG in the Mississippi River Anchorage, on the 17th, when she lost her anchors in high winds.

The cruise vessel VINEYARD QUEEN (fig. 33) went aground, in heavy fog, in Boston Harbor on the 20th. The 88 passengers were rescued without injury. The Very Large Crude Carrier (207,000-ton) METULA grounded in the Strait of Magellan on the 9th. On the 12th, gale-force winter winds swung the stern of the tanker onto the rocks, flooding the engineering spaces and cutting off all power. She finally floated free, on September 25, after unloading operations (fig. 34).

Figure 33.--The VINEYARD QUEEN lists to port as the passengers await rescue. Wide World Photo.

Figure 34.--The tanker HARVELLA transfers oil from the grounded METULA, on Satellite Bank, in the Strait of Magellan. U.S. Coast Guard Photo.

Smooth Log, North Pacific Weather

July and August 1974

SMOOTH LOG, JULY 1974--The number of cyclones was slightly above normal this month. Like the Atlantic, they were generally not very intense. The highest wind reported in any of the extratropical cyclones was 47 kt. There were some fairly significant differences in the primary tracks. The primary track from Japan was more easterly than the climatic northeasterly, until approximately 170°E, when it swung northerly to enter the Bering Sea near the Rat Islands rather than over the Near Islands. The storms that originated in the central Pacific and moved eastward into the Gulf of Alaska were farther south than the climatological track as they approached the West Coast.

The predominant sea-level pressure feature was the Pacific High at 1025 mb. It was located near 35°N, 160°W, 5°S and 10°W of its climatic position. It clearly dominated the eastern ocean. The western part was not as clear-cut with the pressure generally lower than normal with several small pressure centers. A 1011-mb Low was centered off Kamchatka, near 48°N, 168°E, which is indicated as under the influence of the Pacific High in the long-term climatology.

The significant anomalies were negative, and they straddled the Pacific High. The weak pressure gradient, the Low off Kamchatka, and the more southerly storm track off Japan are reflected by a minus 6-mb anomaly centered near 40°N, 170°E. The other anomaly was a minus 4-mb center near 45°N, 145°W. This was a reflection of the more southwesterly position of the Pacific High and more southerly tracks of the storms, south of the Gulf of Alaska. The storms had no better luck penetrating the West Coast, though, as the pressure there averaged 2 to 4 mb higher.

The upper-air pattern was more intense than the climatic mean. The High center was about 100 ft greater and located slightly further west, near 33°N, 165°W. The Low was near the pole with a sharper than usual trough extending southward from east of Kamchatka along 165°E. A near normal minor trough was located just off the North American west coast.

There were three tropical cyclones in the eastern North Pacific; hurricanes Francesca and Gretchen, and tropical storm Eileen. In the western North Pacific there were four; typhoon Ivy and tropical storms Harriet, Jean, and Kim.

The first 2 days of the month there were strong winds off the California coast. The Pacific HIGH was pushing against the coastal mountains with a heat LOW inland. At 1200 on the 1st, the EVRR was buffeted by 40-kt winds along 125°W near Eureka. The PITTSBURGH, headed west from San Francisco, had 35-kt gales on her starboard side. At 0000 on the 2d, the STAR ATLANTIC also had 35-kt gales just south of the Golden Gate, and at 1200 the TRANSONTARIO found the same speed further at sea, near 36°N, 125.5°W. On the 3d, the LOW weakened, relaxing the gradient.

Typhoon Gilda entered the Sea of Japan and by 0600 on the 7th was a 992-mb extratropical storm. She was now bringing heavy rain and thunderstorms to northern Japan.

Early on the 9th, the storm passed eastward through the Tsugaru Strait and the TSURUMI MARU, at 39°N, 151°E, was blown by 35-kt gales. At 1200, the CANADA MARU, one degree of longitude east (39°N, 152°E), was headed into 35-kt south-southeasterly gales. The TRANSOCEAN TRANSPORT was about 150 mi east of the center, at 0000 on the 10th, when she was hit by 40-kt gales blowing 15-ft seas, and 15-ft swells. Thousands of homes were flooded (one report indicated 5,152), bridges were washed away, and many landslides resulted from the heavy rains which were continuing. This is a combined total for the tropical and extratropical damage.

The LOW had weakened as it moved over the Sea of Japan and crossed into the open ocean but, late on the 10th and on the 11th, it deepened again. At 1200 on the 11th, it was 978 mb. That day the PITTSBURGH, which had left San Francisco on the 1st, passed about 120 mi south of the center with winds up to 40 kt. The QUEENSWAY BRIDGE was only a few miles to the south and suffered the same fate. The SILVERCOVE was on the north side of the LOW with 35-kt gales. Seas up to 16 ft and swells up to 25 ft were being reported. At 1800, the MARITIME FORTUNE, at 48.6°N, 170°E, measured that 47-kt wind with 12-ft seas and 25-ft swells.

On the 12th, the EASTERN WORLD was southwest of Attu Island with 40-kt winds and 30-ft seas, and the LOW was moving northward. The MARITIME FORTUNE sailing southwestward had crossed north of the storm center, and at 1800 was about 230 mi southwest of the center. She now measured 38-kt winds, 10-ft seas, and 35-ft swells. At 0600 on the 13th, she was still being pounded by 30-ft swells. The storm continued northward, until 1200 on the 13th, when it abruptly turned eastward for 24 hr. As the LOW slowly filled and moved northeastward through the Bering Sea, it brought rain, drizzle, and fog to the area with only light winds. On the 17th, a center could no longer be found.

This LOW formed as a frontal wave, over Shikoku, on the 10th. It moved over the southern coast of Japan behind extratropical Gilda. As it moved over the Kuroshio Current, on the 12th, it intensified to 992 mb. The HAKONE MARU (37°N, 151°E) and the KAKO MARU (38°N, 147°E) were both treated to 40-kt easterly winds with rain. Winds of at least 35 kt were blowing all around the center as the PORTUGAL MARU and JCLK could attest.

The LOW was moving slowly eastward as it passed south of extratropical Gilda early on the 14th. Later in the day it picked up speed and raced across the central ocean at up to 40 kt. During this period the central pressure rose to 1009 mb. As it approached 140°W the speed slackened and the pressure started to fall again. At 1200 on the 16th, there were two 1000-mb centers and the HAWAIIAN CITIZEN received 35-kt gales from the eastern one. Twenty-four hours later the storm

self-destructed on the coastal mountains.

This storm started out north of Peking, on the 10th, and moved southward until the 12th. Then, near Shanghai, it headed eastward across the East China Sea. On the 14th, it was over the Sea of Japan. As it moved over the Kuroshio Current it deepened, as had the last storm. At 0000 on the 16th, the ASHBY MARU, near 39°N, 155°E, was about 100 mi east of the 992-mb center with 35-kt winds. By 0000 on the 17th, the 986-mb storm was near 42.5°N, 167°E. Many ships were reporting 25- to 30-kt winds all around its circulation. Southeast of the center the IWAKI MARU, at 39°N, 173°E, found 40-kt gales from the south.

The LOW was now running to the northeast, and, at 0600 on the 18th, crossed the Aleutian Islands near Amchitka Island into the Bering Sea. At 1800 on the 18th, the MAJESTY, near 50.5°N, 172°W, was contending with fog and 40-kt winds. The LOW went ashore, at 1200 on the 19th, and deserted the charts.

Tropical Cyclones, Western Pacific--Tropical storm Harriet was first detected in the Philippine Sea on the 15th. She was already heading northwestward toward Japan. Later in the day Harriet crossed the 20th parallel near 136°E. Maximum sustained winds reached 40 kt near her center the following day; gales extended out about 50 mi. However this was the extent of Harriet's fortunes. After turning northward she weakened rapidly and by the 17th had dropped to depression strength. There was some potential for redevelopment as Harriet moved under an upper-level anticyclone. Cloudiness increased, but evidently the system had lost too much of its convection. By the 18th all that was left was a weak depression near 29°N, 136°E.

While Harriet was struggling to survive on the 17th, Ivy and Jean were blossoming on the Philippine Sea. Tropical storm Jean developed near 20°N, about 300 mi east of the Luzon Strait, while Ivy was taking root in a more favorable climate, some 300 mi northwest of Yap Island. Tropical storm Ivy headed west-northwestward while Jean took a northwesterly path. Ivy quickly grew to typhoon strength as she spread toward northern Luzon. By the 19th she was climbing the eastern slopes of the island. Maximum sustained winds were about 100 kt with gusts to near 125 kt. Gales extended out 100 to 150 mi.

Meanwhile Jean was plodding toward Taiwan. Her winds had increased to about 55 kt near the center while gales extended out 50 to 100 mi. Jean brushed northern Taiwan, near Taipei, and then clipped mainland China, all on the 19th. She fizzled out the following day near Shanghai.

However Ivy was still spreading. While she made it across the rugged island of Luzon without losing typhoon strength, she was weakened by the trek. Winds near her center fell to 65 kt before she recovered in the friendly waters of the South China Sea. Ivy headed west-northwestward. The AMERICAN CHALLENGER was at 20.1°N, 121.2°E, at 1800 on the 20th, with 45-kt southeasterly winds. By the 22d, winds had climbed back to 90 kt near her center, with gales extending out to about 150 mi. That day Ivy banged ashore near Tien-pai on mainland China, just 200 mi down the coast from Hong Kong.

Tropical storm Kim flared briefly in the mid-Pacific on the 23d. She was first detected about 250 mi north of Wake Island. She was tropical for just a day. As Kim headed northeastward cold air intruded into the circulation and she turned extratropical. Winds at the time were about 50 kt near her center.

Tropical storm Kim was extratropical by 1200 on the 24th. This did not stop the winds from blowing around her wide circulation. At 0000 on the 25th, the 992-mb LOW was at 28°N, 164°E. The ASIA MOMO was about 360 mi to the west, near 29°N, 157°E, with 40-kt gales. The storm had been tracking westward but late on the 25th curved back to a north-northeasterly track. On the 26th, the AMELIA TOPIC encountered 35-kt gales south of the center. On the 27th, the storm was moving northward through the major shipping lanes but no gale-force winds were plotted.

On the 28th, the LOW was again strengthening and had a central pressure of 984 mb by 1200. There were four reports of gale-force winds. They were from the EDELWEISS (16-ft seas and swells), GOLDEN EXPLORER (23-ft swells), TYUMENJNEFT, and the USCGC STATEN ISLAND. About 0600 the storm center had crossed into the Bering Sea. A HIGH was firmly located in the Gulf of Alaska and the highest winds were on the eastern side between these two centers. Two ships and a land station reported 40-kt gales along the Aleutian Islands. On the 29th, the USCGC MIDGETT was bounced by 40-kt winds near Unimak Island. About 1800 that day, the storm passed through the Bering Strait into the Chukchi Sea to disappear.

Tropical Cyclones, Eastern Pacific--Tropical storm Eileen was formed from an area of showers, squalls, and thunderstorms, near 15°N, 110°W, about 500 mi south of the tip of Lower California and began developing on June 28. A gradual intensification took place, and the area remained nearly stationary. By July 2, a weak tropical storm had formed, near 16.2°N, 111°W, but no ships were in the vicinity to verify development. Socorro Island, about 200 mi north of the center, reported east winds at 5 kt.

A slow northward movement was indicated with the center of activity moving to near 17.8°N, 111°W by 0000 on July 3. The storm moved over cooler water and weakened to a tropical depression. The depression continued to weaken. It moved northwestward until 1800 on the 3d, and then westward to near 20°N, 115°W at 1800 on the 4th. The last of the circulation, after the storm dissipated, was still visible in satellite pictures, near 19°N, 114°W, at 2145 on the 5th.

A telltale cluster of clouds in satellite pictures suggested the seventh tropical cyclone (including depressions) in the eastern North Pacific might be forming, near 9°N, 91°W, early on the 12th. The cloud mass which was to be hurricane Francesca was followed westward, on the 12th, with cyclonic circulation beginning about 1800 on the 13th and indicated by the ROSE CITY, IRISH CEDAR, TASMANIC, UYJE, and KFAC, all far enough from the center to experience only light wind and occasional heavy rain.

On the 14th a more northwesterly track began from near 11°N, 99°W to 15°N, 106°W by the afternoon of the 15th. Intensification to a tropical storm occurred

early in the night of the 15th, with the storm reaching 50 kt, by 0600 on the 16th, while moving northwestward at 10 kt. This velocity continued until hurricane intensity was reached, at 1200 on the 18th, near 22.5°N, 112.5°W. Back at 0000 on the 17th, the TIJUCA reported 50-kt southwesterly winds near 17.5°N, 108°W. The sea waves were 30 ft.

A westward movement and weakening began as Gretchen moved into the area from the southwest and south. Francesca was absorbed by Gretchen near 22.5°N, 119°W, at 1200 on the 19th.

Vessels whose reports helped locate, track, and indicate the storm's intensity were the ALEMANNIA, COPAN, HAMBURG EXPRESS, HANYANG, HEMIFUSUS, HOLTAV, LYMAN HALL, NORDSTERN, TIJUCA, WESTER, and the YAMANASHI MARU.

Every few years two tropical cyclones will develop within 600 to 1,000 mi of each other and an interesting phenomenon occurs. This was first recognized by Dr. Fujiwhara early in the 1930's. The cyclones tend to rotate around a central point somewhere between the two centers.

Francesca was a developing tropical disturbance near 12°N, 98°W, at 1800 on the 13th, as thunderstorms near 11°N, 114°W began to grow in areal coverage and vertical development. They moved west at 10 kt, then curved to the north and northeast to near 14°N, 116°W, at 0000 on the 17th. Maximum winds were near 30 kt.

As Francesca moved northwestward a band of strong southwest winds moved into the area of the depression, and the warm moist air caused gradual intensification to tropical storm Gretchen, by 1200 on the 18th. Intensification accelerated and successive 30-min satellite pictures indicated hurricane intensity was reached by 1800 on the 18th. From 1800 on the 17th to 1800 on the 18th, the intensifying storm traveled 450 mi. The intensification appeared so rapid that an Air Force reconnaissance aircraft enroute to Francesca was requested also to look over Gretchen. After measuring Francesca the aircraft proceeded to Gretchen at 21.5°N, 111.5°W and measured 85-kt winds 20 mi east of the center at 1946.

Gretchen curved to the northwest and then westward to 23°N, 119°W, at 0000 on the 20th, and weakened to a tropical storm. It jogged to the north during the night and then westward, dissipating near 25°N, 122°W, at 0000 on the 21st, where the cool water and drier North Pacific air had weakened Francesca earlier. Although a circulation continued in satellite pictures for several days, surface winds had apparently returned to normal by late on the 20th.

Vessels whose reports were helpful in tracking Gretchen included the CAPISTERUA, CORNELIA MAERSK, HOWELL LYKES, KARUKERA, KAWACHI MARU, KISO MARU, MADAM BUTTERFLY, MARGARET JOHNSON, TAEPING, TOKUSEI MARU, and the WAWAKUSA MARU.

The strongest wind reported by a ship was by the TAEPING, near 19.9°N, 111.5°W, at 1800 on the 18th--55 kt. No reports of damage to vessels have been received.

Casualties--There was heavy fog with visibility down to 300 ft in the Bungo Strait when the 2,999-ton Panamanian WESTERN STAR and the 12,292-ton KIKKO MARU collided, at 5:30 a.m. on the 28th. The WESTERN STAR sank almost instantly and 24 crewmen were missing, 2 were rescued. Patrol boats, an airplane, and a helicopter searched for survivors.

The 3,448-ton Philippine DIAMOND dragged anchor in Manila Bay, during typhoon Ivy, and ran aground at the mouth of the Posig River on the 20th.

SMOOTH LOG, AUGUST 1974 -- The North Pacific was quiet this month, even for a summer month, as far as extratropical cyclones were concerned. The same can not be said for tropical cyclones. The extratropical storms in general were weak. There were several deep storms, but they did not generate exceptionally high winds, at least they were not observed and reported.

The storm tracks were more dispersed than usual, located more easterly with more of a northerly component. According to climatology there are three primary tracks; one from Mys Loptaka across the Bering Sea to the Bering Strait, another from Honshu to the Pribilof Islands, and the other from about 50°N, 160°W into the Gulf of Alaska. In general the Mys Loptaka track storms curved more northerly and into eastern Siberia. The Honshu track originated further east and also curved more northward into the western half of the Bering Sea. The track south of the Alaska Peninsula was located about 10° latitude farther south (40°N) and traced a path eastward.

The mean pressure pattern did not match climatology very well, as might be expected since the cyclone tracks did not match well. The dominant feature remained the Pacific High, but its orientation was quite different. The main center was 1024 mb located near 50°N, 140°W, with a subcenter of 1018 mb near 30°N, 180°. It had a boomerang shape. The climatic mean is an egg shape lying on its side with the small end pointed westward and a 1025-mb center near 40°N, 150°W.

The normal location of the mean 1009.8-mb Aleutian Low is near Mys Navarin. This month there were two centers, a 1005-mb near 52°N, 173°E and a 1007-mb in the Sea of Okhotsk near 53°N, 147°E. The pressure over the western third of the ocean was well below normal with two Low centers, one near Daito Jima and the other midway between Hainan and northern Luzon. The pressure over Alaska was above normal.

The anomaly pattern was interesting with all the misplaced centers. A large area of the central ocean was covered by negative anomaly isolines. A negative 8-mb center was located near 40°N, 160°W. Another negative 8-mb center was located near 28°N, 138°E. The pressure all along the North American Coast was above normal with a positive 6-mb center located north of Anchorage.

The upper-air pattern more closely resembled climatology with an elongated High centered along 30°N. A LOW was centered over the Bering Sea where normally only a trough exists. The high pressure off the West Coast was reflected by a well-defined ridge in the upper air. As with the surface the heights of the pressure surfaces were low over the Philippine and South China Seas. The anomaly pattern matched the surface with positive values over Alaska, and negative centers in midocean and over southwestern waters.

There were six tropical cyclones in the western North Pacific; two typhoons, Mary and Polly, and four

tropical storms, Lucy, Nadine, Olive, and Rose. In the eastern North Pacific there were seven tropical cyclones; five hurricanes, Ione, Joyce, Kirsten, Maggie, and Norma; and two tropical storms, Helga and Lorraine.

This first storm was minor and just did make it over water before dissipating. It came out of Manchuria fairly well developed for this time of year. By the 3d, its circulation was affecting the Sea of Okhotsk. At 1200 on the 4th, the front was paralleling the Kuril Islands and the ARKHIP KUINDZHI was blown by 40-kt winds east of the occlusion near 50°N, 153°E. Late on the 5th, the circulation was dead.

The first third of the month a large HIGH dominated the eastern ocean off the North American coast. Its center gradually drifted eastward as the pressure along the coast remained essentially constant. This tightened the gradient and gale-force winds were occasionally reported, off the coast, through the 11th. At that time the HIGH moved northward into the Gulf of Alaska and relaxed the pressure gradient. The SEALAND EXCHANGE and WALTER RICE both suffered winds as high as 40 kt.

This low center formed, on the 8th, just south of the tip of the Kamchatka Peninsula near a frontal occlusion. The LOW moved slowly eastward and, by 0000 on the 11th, was near 50°N, 170°E at 996 mb. Later in the day, the EMMA JOHANNA and the MAMMOTH PINE were in the vicinity of the Near Islands with 35- and 40-kt winds. Both reported seas of 13 ft.

On the 12th, the LOW center passed over Attu Island into the Bering Sea. The GOLDEN LIGHT measured 38-kt southeasterly winds. On the 13th, the LOW nearly stalled in the vicinity of 55°N, 175°E, but still had a northward drift. The USCGC MUNRO was near Umnak Island with 40-kt gales. On the 15th, the LOW, which was filling, picked up its northward drift and was over the Anadynskiy Zaliv, on the 16th, where it disappeared.

A series of unstable waves had moved eastward along a weak front that stretched east-west eastward from Honshu. On the 17th, one of these survived and a 1003-mb LOW was detected near 43°N, 171°E. Twenty-four hours later, it had turned northeastward and was 994 mb. The seas and swells had built rapidly as the ASIA BRAVERY lived up to her name near 49.4°N, 177.7°E with 33-ft seas and 36-ft swells. She reported measuring only 35-kt winds at that minute.

This LOW traveled northward and then curved northwestward, on the 19th, when it entered the Bering Sea. The PRESIDENT TAFT, at 47.6°N, 169.8°W, reported 35-kt gales. At 1200, the ASIA BRAVERY was still battling 33-ft swells. The LOW was over the Bering Sea, on the 20th, and was absorbed by another LOW, on the 21st, that was following the same track. The second LOW treated the PRESIDENT PIERCE to 40-kt winds on the southwest side of the center, and the WORLD PELAGIC and CRESSIDA to 35- to 40-kt winds on the northeast side. The ASIA BRAVERY, which was sailing eastward along about 50°N, had dropped her swell report to 30 ft.

The Pacific north of 35°N contained a series of relatively small LOWs on the 18th. On the 19th, a new LOW developed, near 41°N, 171°W, at the triple point of the front extending from the one nearest midocean. The BIRTE HUGO STINNES was near 34.5°N, 172°W, just east of the cold front, with 45-kt gales and 21-ft seas and swells. It moved eastward, and, on the 20th, there were no ship reports in the area of the storm where the previous strong winds had been observed. On the 21st, the MANCHESTER CONCEPT reported 35-kt winds about midway between two of the LOWs. At 1200 on the 21st, the LOW was at 43°N, 152°W and the KNFD was at 36°N, 155.5°W with 40-kt gales.

The LOW turned northeastward on the 22d and then eastward again on the 23d while increasing in pressure. On the 24th it turned southward and dissipated.

On the 22d, a front stretched east-west across the Sea of Japan from northern Honshu to North Korea. Tropical storm Mary was emerging from the Chinese mainland to regenerate over the East China Sea. This circulation pulled that portion of the front over the Yellow Sea southward, and on the 23d and 24th waves were forming along the front and moving northeastward over the Sea of Japan. As one of these passed along the Kuril Islands, Ostrov Simushir measured 50-kt winds, on the 24th. The BENVORLICH (36°N, 149°E) and the GOLAR BOW (42°N, 150.5°E) reported 35- and 40-kt winds respectively, on the 25th.

At 1200 of the 25th, one of these waves developed sufficiently to persist and identify from one chart to another. This LOW moved rapidly north-northeastward at about 55 kt. At 0000 on the 26th, it was at 49°N, 147°E, and 992 mb. The Kuril Island of Simushir again was hit by 50-kt winds. By the 27th, the LOW was moving eastward over the top of a HIGH and the DAIAN MARU, near 46.5°N, 167°E, was sailing into 35-kt gales.

Now that the storm had moved over warmer waters and over the top of the ridge it started to intensify. At 0000 on the 28th, it was near 50°N, 175°E. Earlier the LOW center had passed near the MARUSUMI MARU and now treated her to 55-kt winds, 31-ft seas, and 20-ft swells. Her location was 49°N, 174°E, or about 120 mi west of the center. The LOW now had a southerly component to her track before turning northward toward the Bering Sea on the 29th. At 1200 on the 28th, the PHILIPPINE MAIL was lashed by 45-kt gales near 47°N, 179°W. This was near the same relative position to the storm's center where the MARUSUMI had received the strong winds earlier in the day.

The area covered by the storm's circulation was expanding as it absorbed another LOW. The SEALAND COMMERCE was close to 40°N, 174°W and headed into 45-kt gales. The seas were 20 ft. Further north and east the KYOKUYO MARU had 35-kt gales on her starboard side. The pressure had dropped to 971 mb. At 1800 on the 29th, the LOW crossed into the Bering Sea, and within 30 hr was absorbed by a LOW that moved out of Siberia.

This LOW formed, on the 30th, in the col area between typhoon Polly and a LOW in the Bering Sea. It moved rapidly to the northeast, deepening as it went. By 0000 on September 1, the pressure had plunged to 972 mb and was centered at 52°N, 167°E. The DAISHIN MARU was about 90 mi south of the center and battled 50-kt winds on her bow. The seas were 16 ft

and the swells 30 ft from the southwest. The DURBAN MARU, southeast of the center, near 48.5°N, 176°W, contended with 35-kt gales. Twelve hours later, the winds and waves had not subsided for the DAISHIN. The SANTA CATALINA MARU reported 45-kt winds driving 15-ft seas and 20-ft swells at 48.2°N, 164.8°E. The LOW was now drifting westward and made a loop near 50°N, 170°E.

On the 2d, the GOLDEN ARROW was about 150 mi south of the center and was beaten by 45-kt gales. The waves were up to 16 ft. The OJI MARU, about 100 mi southeast of the center, reported 40-kt gales.

On the 3d, the LOW was again moving northward and filling. This relaxed the gradient, and another LOW moved south of it further reducing the wind speeds. On the 5th, the LOW became stationary in the vicinity of Mys Olyutorskiy until it disappeared on the 7th.

There was no storm this month worthy of the title "Monster of the Month."

Tropical Cyclones, Western Pacific--Tropical storm Lucy flared up briefly east of the Luzon Strait on the 9th. Winds reached 40 kt with gusts to 50 kt near her center. By the 10th she was moving northward trying to squeeze through the Formosa Strait. She couldn't make it, and on the 11th Lucy petered out between Taiwan and mainland China.

Meanwhile, 300 mi east of Saipan a large sprawling storm was coming to life. Mary was developing at a time when a strong monsoon was covering most of the Philippine Sea. This enlarged her circulation to the point where she wreaked havoc on Guam some 360 mi to the west-southwest. Peak gusts of 57 kt from 250° were recorded at Andersen Air Force Base on the 12th and 13th. Gusty winds exceeding 30 kt began on the 12th and persisted through the 14th while Mary moved slowly northward then northwestward.

The 25,794-ton Panamanian passenger ship CARIBIA en route from New York City to Kaohshung, Taiwan, where she was to be scrapped, went aground in the entrance to Apra Harbor, Guam, on the 12th. The harbor had to be closed for several days. The German tug HAMBURG was towing the ship when they encountered heavy seas about 3 mi from Guam. The tug captain cut the ship loose, and it finally lodged on the rocks near the breakwater. Several smaller vessels were also driven aground. Another tug, the SAKURA MARU, riding out the storm west of Guam, was forced to cut loose her tow of drydocks on the 12th.

The Island of Guam bore some damage to powerlines, trees, and crops. Two people died including a 7-yr-old girl who drowned while swimming in a pond; the other was a 19-yr-old U. S. sailor who drowned while surfing.

On the 15th near Chichi Jima Mary turned westnorthwestward. Meanwhile little Nadine was coming to life in the Philippine Sea near 16°N, 126°E and drifting eastward. Nadine reached tropical storm strength and turned northeastward on the 16th while Mary was heading for the Ryukyu Islands. Big Mary, while staying below typhoon strength, had gales that extended out to 400 mi in her eastern semicircle. She reached typhoon strength briefly on the 18th in the East China Sea while Nadine was weakening as she made her way toward the coast of Honshu. On the 18th, Nadine fell to depression strength near 30°N, 140°E, but continued to move northwestward bringing some rain to southern Honshu. One day later Mary collapsed as she collided with mainland China, about 100 mi south of Shanghai. Confused and disorganized, the remnants of the storm rebounded back into the East China Sea. On the 23d Mary began to get it together again. She slashed her way across Okinawa and back into the open Pacific on the 24th. The PRESIDENT PIERCE, at 26°N, 127.7°E, had enjoyed a rather peaceful voyage, until she was ravaged by 65-kt winds at 0600. The following day proud Mary was a raging typhoon steaming northeastward toward Honshu. Maximum winds were 65 kt with gusts to 80 kt. As Mary neared the coast she fell to tropical storm strength. She beached near Lake Hamana, south of Nagoya. Floods and landslides were common as Mary dumped up to 20 in of rain over the mountainous regions of Chubu and Kanto. She continued to weaken as she crossed Honshu on the 26th.

While Mary was beating herself out over Japan, Polly was developing right near Saipan and Rose was blooming east of Taiwan. It took Polly just 2 days to become a typhoon, which she did on the 27th about 120 mi north of Saipan. She was moving north-northwestward. The following day Rose became a tropical storm as she moved northeastward. Polly's winds reached 100 kt on the 29th as she passed Iwo Jima. Rose's winds were around 50 kt on the 29th as she brushed Okinawa. However, Rose weakened and turned eastward on the 30th. She dropped to tropical depression strength on the 31st and was gobbled up by Polly who was by this time to the north, near 30°N, 136°E, and closing in on Japan.

Maximum winds were 90 kt near Polly's center as she neared Shikoku. She crossed the island on the 1st of September bringing strong winds and heavy rains to both Shikoku and Honshu. Kochi reported 107-kt winds and Cape Muroto clocked winds at nearly 90 kt. Up to 20 in of rain were dumped over the region. Four people were killed in the resultant floods and landslides. The typhoon continued across southern Honshu and into the Sea of Japan unleashing strong winds and heavy rains over a wide area. The Tokyo metropolitan area suffered one of its worst floods in years despite the fact that it was not hit directly. Polly turned extratropical in the Sea of Japan on the 2d.

Tropical Cyclones, Central Pacific -- Tropical storm Olive flared up briefly in the central Pacific. She was first sighted as a depression, on the 23d, near 13°N, 152.5°W. Moving west-northwestward at about 10 kt she intensified to tropical storm strength early the following day. Early on the 24th, maximum sustained winds reached 40 kt near her center while gales extended out 75 mi in all directions. However, before the day was through Olive had dropped back to a depression near 14°N, 156°W.

Tropical Cyclones, Eastern Pacific--The intertropical convergence zone was quite active near 10°N from the coast westward to 140°W early in August. A number of tropical disturbances formed but none developed into an organized system until August 9 near 13°N, 109°W. A review of satellite pictures gave no clue as to why this particular area developed more vigorously than others, and observations from the thinly scat-

tered vessels in the area were not sufficient to help.

The depression moved toward 300° at 8 to 10 kt, a course and speed it maintained during gradual intensification to tropical storm Helga, at 1800 on the 10th, near 14°N, 114°W. That course, speed, and intensity continued to near 16°N, 121°W, at 1800 on the 11th. Gradual weakening took place and by 1800 on the 12th the tropical storm became a tropical depression. Twenty-four hours later the depression had dissipated near 16°N, 124°W.

The only vessel near Helga was the MEDER LEK at 1800 on the 10th. She reported a west-southwest wind of 20 kt and a pressure of 1008.1 mb 125 mi east-southeast of the storm. The strongest wind indicated in advisories was 40 kt, and that for only one 6-hr period.

Satellite pictures during the morning of the 17th showed increased activity on the intertropical convergence zone near 12°N, 114°W. By the end of the day, a disturbance was identified and tracked westward at 16 kt. The westward speed slowed to about 10 kt as development took place, reaching tropical storm intensity near 14°N, 128°W, at 1800 on the 20th.

Tropical storm Ione, with 35-kt winds, curved a little southwestward and weakened to a tropical depression on the morning of the 22d and then continued west to near 12.5°N, 138.5°W, at 1800 on the 23d. Morning satellite pictures showed considerable intensification had taken place since the infrared pictures taken the night before, and the depression was raised to hurricane classification with 65-kt winds.

Ione continued intensifying, with 100-kt winds by 0600 on the 24th, as it curved into the Honolulu area of responsibility near 13°N, 140°W. The hurricane was moving west-northwestward at 10 kt with winds of 80 to 100 kt. The track curved slowly northward and, by 1200 on the 26th, Ione was centered near 17°N, 144°W. She then moved a little east of north, slowing and weakening rapidly on the 27th: from a hurricane with 70-kt winds at 1200 to a tropical storm with 50-kt winds at 1800 and to a tropical depression with 30-kt winds at 0000 on the 28th.

The MARCONA TRANSPORTER overtook Ione during the period of the 22d to the 26th, passing about 105 mi northwest of the center at 1800 on the 25th. The maximum winds she reported were 30 kt, the highest seas 10 ft, and swells of 16 ft with a period of 14 sec.

As tropical storm Ione decreased to a depression early in her life, two disturbances were forming at nearly the same latitude, 600 mi and 1,500 mi to the east. The more interesting of these was near 13°N, 110°W, an area of thunderstorms and squalls in which no center of rotation was apparent from the few peripheral ship reports. After viewing a movie loop of ATS-3 pictures taken on the 21st, it was evident that a circulation had begun near 14°N, 109°W. The depression moved northwestward and slowly intensified to become tropical storm Joyce at 1800 on the 22d near 15°N, 110°W.

The other disturbance developed into a depression near 14°N, 124°W, at 0600 on the 22d, and by 1800 had increased in intensity to tropical storm Kirsten.

Tropical storm Joyce, moving northwestward at 10 kt, increased in intensity to 60-kt winds, at 1800 on the 23d, near 17°N, 112.5°W, to 70 kt at 0000 on the 24th, to 75 kt at 1800 near 17°N, 116°W, and then began a gradual decline.

While Joyce was developing into a hurricane, and midway to tropical storm Kirsten, a tropical depression was forming near 11°N, 117°W. The depression developed rapidly into tropical storm Lorraine with 35-kt winds near the center and was moving northwestward at 8 kt as indicated by infrared photographs.

Another depression, this in the Central Pacific, formed near 13°N, 151.5°W, and began developing. Four active storms at one time in the eastern North Pacific is a rare occurrence. This is the first known occurrence of five simultaneous storms. The only other time four named storms occurred at the same time was in 1966.

Tropical storm Joyce, with 60-kt winds, was moving westward at 7 kt near 19°N, 120°W, at 0000 on the 26th, when tropical storm Maggie formed near 12°N, 105°W, shortly after Ione moved into the central Pacific. By 2100, the winds had increased to hurricane strength again (70 kt) near 19°N, 122°W. Joyce decreased to a tropical storm near 19°N, 125°W, at 0600 on the 27th, and by 1800 was a 30-kt tropical depression rapidly dissipating.

No vessel reported more than 20-kt winds during the life cycle of Joyce, but also none reported closer than about 300 mi of the center.

A series of tropical depressions and disturbances was occurring between 10°N and 15°N and from 105°W to 135°W on the 22d. One near 14°N, 124°W was moving northwestward at 15 kt at 0600. The depression was caught between Ione to the west and Lorraine to the east. It slowed as it intensified to become tropical storm Kirsten near 15°N, 126°W at 1800.

Further slowing to 8 kt and intensification to hurricane strength occurred prior to 0000 on the 24th near 16.5°N, 130.5°W. A vessel 120 mi south of the from the center.

The storm was nearly stationary and torn between interacting with Joyce to the west or Lorraine to the east. At 1200 on the 25th she weakened to a tropical storm near 16.5°N, 126.8°W and chose Lorraine by heading southeastward. Kirsten weakened to a tropical depression near 14°N, 127°W, at 0000 on the 29th, and special bulletins on her were discontinued.

A disturbance developed into a tropical depression near 11°N, 118°W, some 480 mi southwest of Joyce and 600 mi east-southeast of Kirsten, at 0000 on the 23d. The depression was moving northwestward at about 8 kt with winds of 30 kt in squalls near the center. Six hours later satellite pictures indicated it had intensified to tropical storm Lorraine.

The northwestward movement continued, through 1200 on the 24th, to near 12°N, 121°W, followed by a 10-kt northeastward movement, through 1800 on the 26th, to near 15°N, 117°W. Another jog in the track toward the northwest continued until 17.5°N, 119.5°W was reached, and the storm weakened to a depression. The depression then moved southwestward, weakened, and finally dissipated near 17°N, 122°W, at 0600 on the 28th.

Vessels whose observations helped locate and track the storm included the IWATI MARU, the TUGELA, GRED, and GZPZ.

(Continued on page 49.)

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic

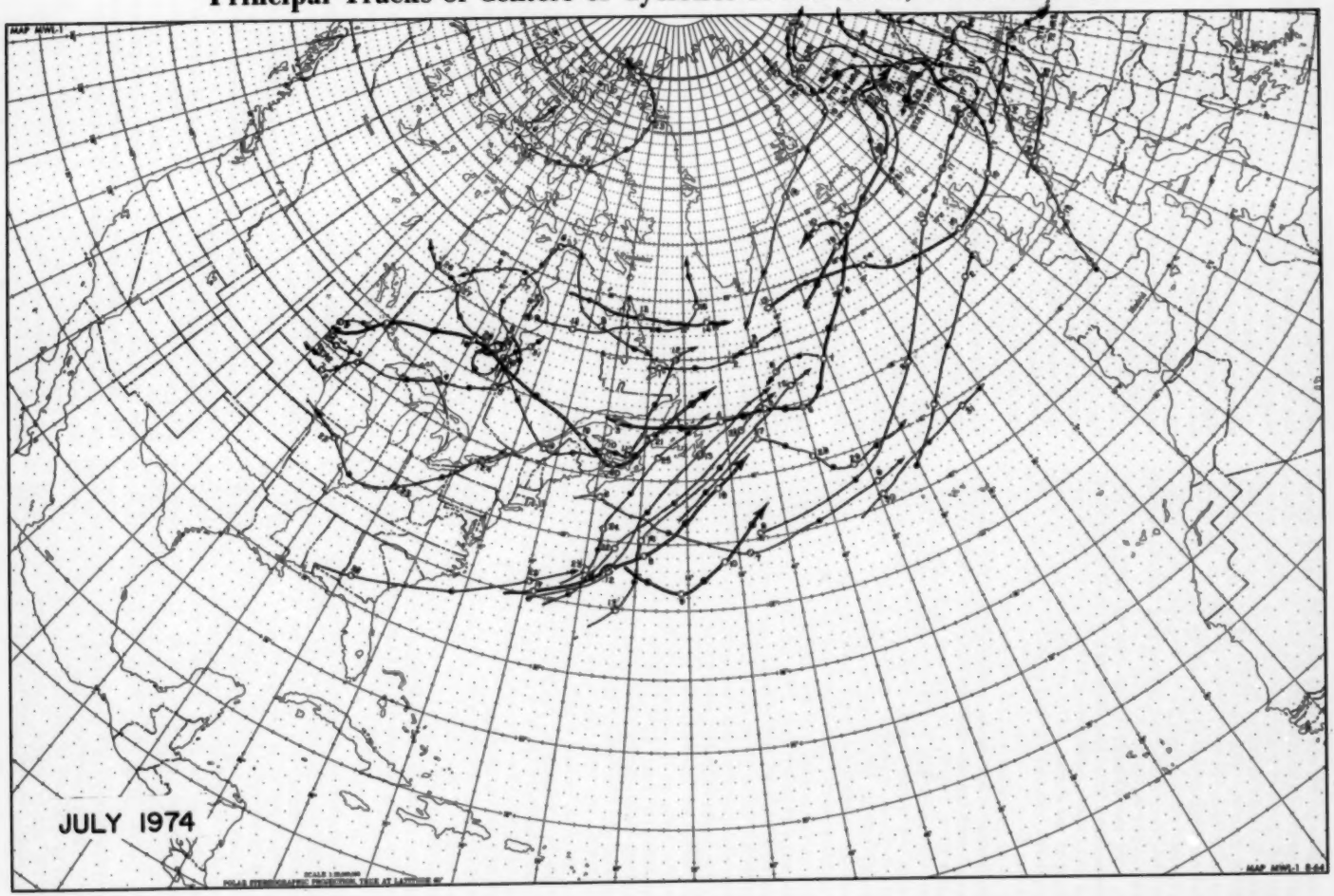

Figure 35. --Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic

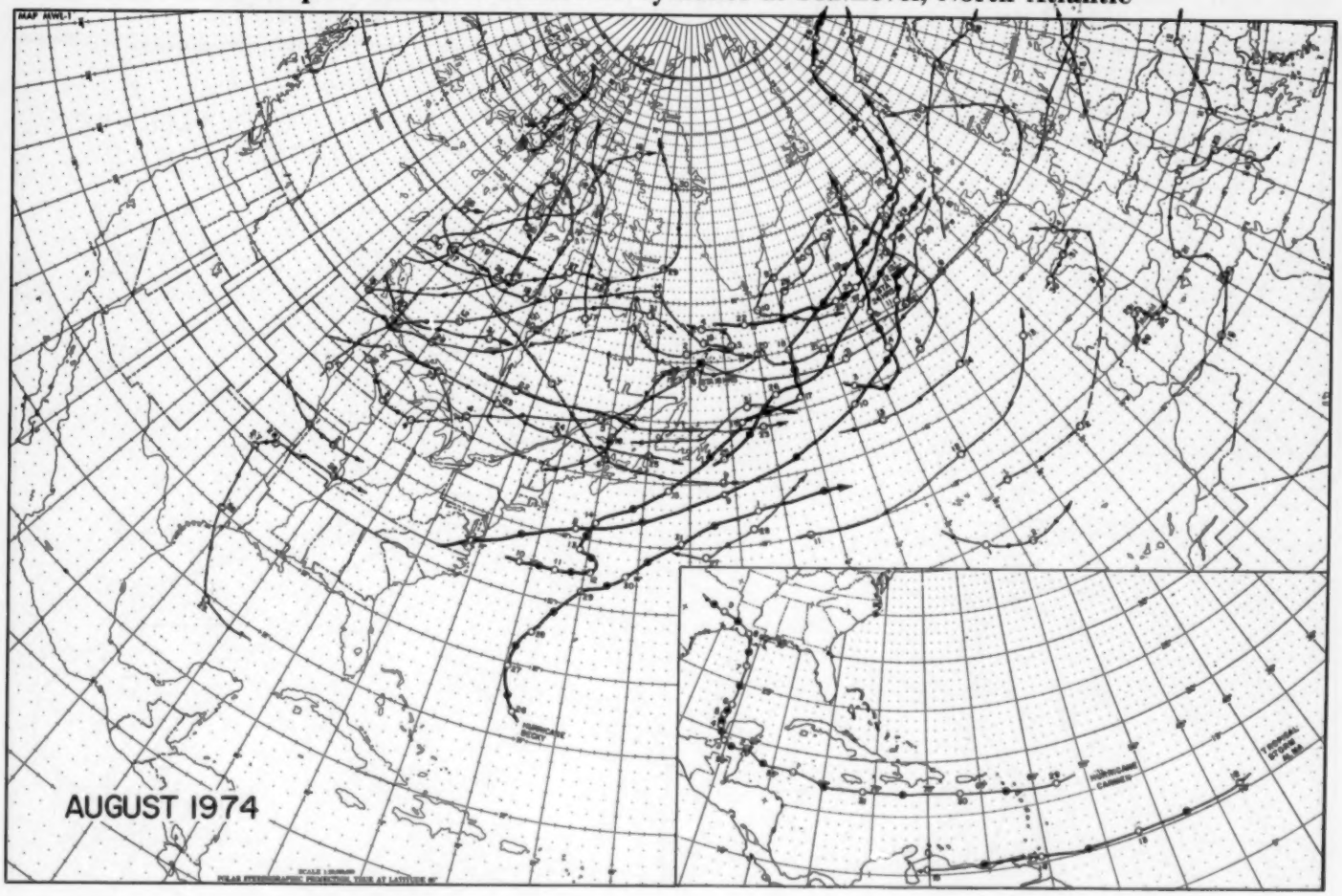

Figure 36.--Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific

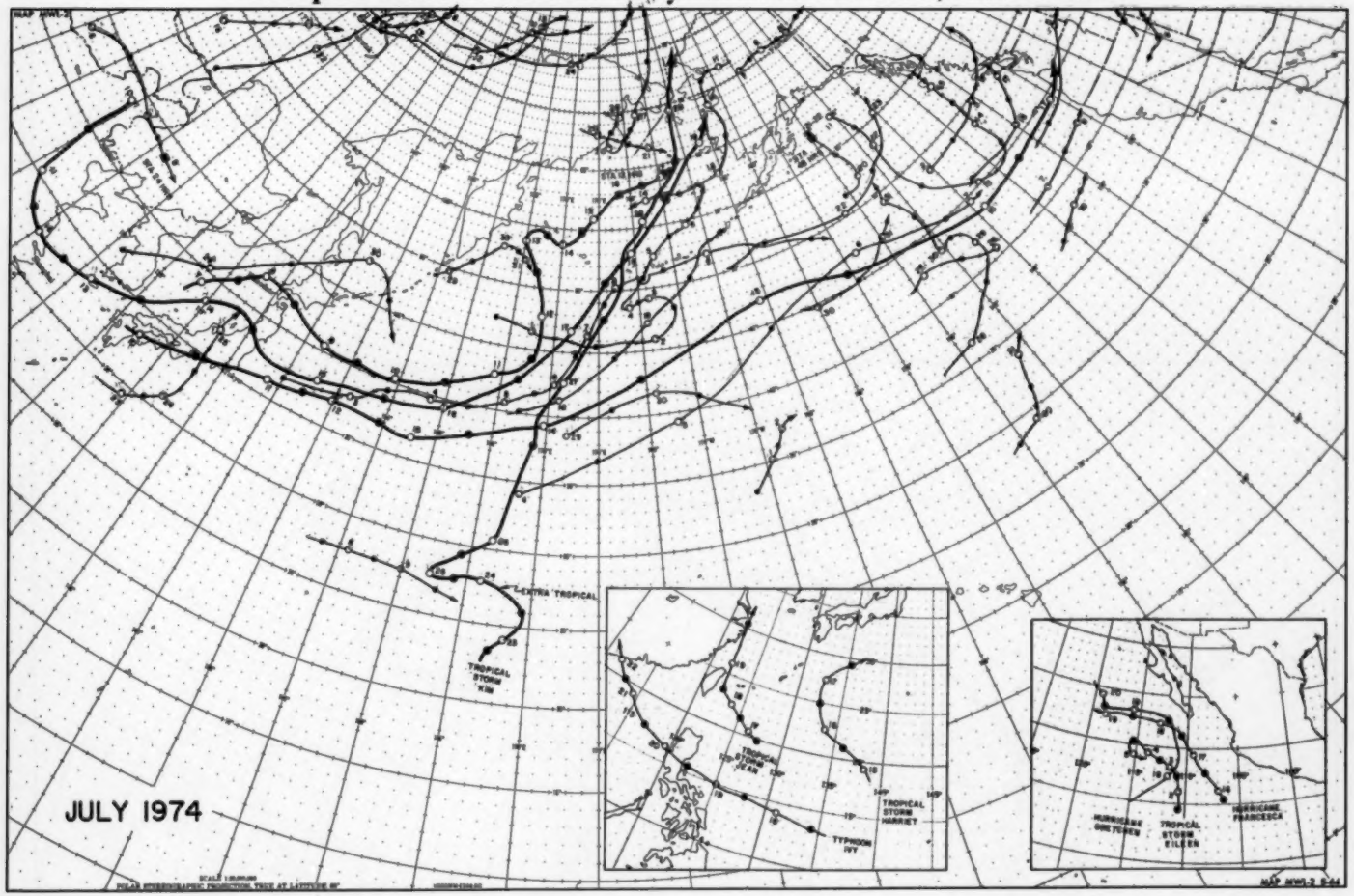

Figure 37. --Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific

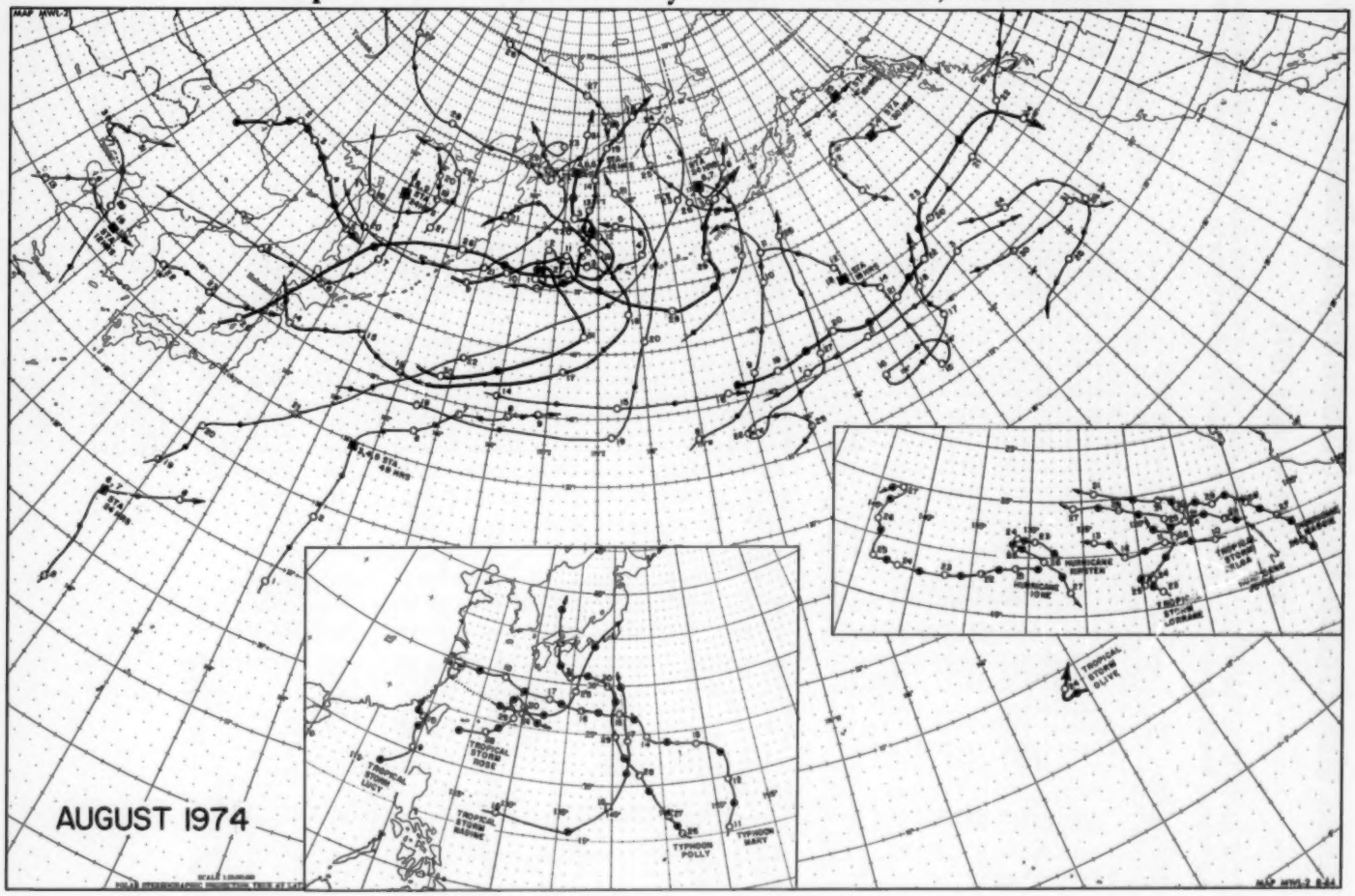

Figure 38.--Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

Table 8

U.S. Ocean Buoy Climatological Data

July and August 1974

Beginning with this issue, Monthly Ocean Buoy Climatological Data will be summarized and appear at this position in the "Marine Weather Review." Ocean Weather Station "Hotel" will also be summarized when available.

JULY — DATA SUMMARY — EB02

AVERAGE LATITUDE 47.0N — AVERAGE LONGITUDE 130.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	09.9	(07 12)	12.7	17.1	(29 00)	247	31
DEWPOINT TEMP (DEG C)	08.9	(05 12)	11.0	15.9	(31 03)	220	29
SEA TEMP (DEG C)	11.8	(04 12)	12.9	13.8	(29 03)	246	31
AIR-SEA TEMP (DEG C)	-02.1	(07 12)	-00.2	02.4	(28 00)	246	31
PRESSURE (MB)	1000.2	(16 18)	1019.7	1030.8	(25 06)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N	.8	8.5	8.9				17.8	10.2
NE	2.4	3.2					5.7	4.5
E	1.2	4.5	1.6	1.2			8.5	10.3
SE		.8	2.4	.4			3.6	13.6
S		4.5	4.9	2.8			11.7	15.5
SW	.8	5.3	6.1	1.6			13.8	12.4
W	.4	9.3	8.1				17.8	10.6
NW	.4	4.5	11.7	2.8			19.0	14.2
CALM	.8						.8	.0
TOTAL	6.1	39.7	45.3	8.9			100.0	11.8

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
247	33 KTS	300 DEG	(14 19)

PRECIP
NO. OF DAYS WITH PRECIP: 9 NO. OF DAYS WITH REPORTS/ COMPLETE: 30 PARTIAL: 1
NO. OF OBS WITH PAST OR PRESENT PRECIP: 19 NO. OF WEATHER OBS: 247

AUGUST — DATA SUMMARY — EB02

AVERAGE LATITUDE 47.0N — AVERAGE LONGITUDE 130.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	13.3	(20 09)	14.9	17.1	(02 03)	248	31
DEWPOINT TEMP (DEG C)	08.7	(05 15)	13.4	16.2	(29 00)	185	26
SEA TEMP (DEG C)	15.1	(15 12)	15.6	16.1	(25 00)	248	31
AIR-SEA TEMP (DEG C)	-02.2	(20 09)	-00.7	01.2	(02 00)	248	31
PRESSURE (MB)	1012.4	(22 05)	1021.7	1029.0	(08 21)	248	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N	.9	2.8					3.7	4.3
NE	.9						.9	1.0
E								
SE								
S								
SW		2.8					2.8	7.7
W	.9	4.7	5.6	.9			12.1	12.7
NW		9.3	57.9	12.1			79.4	16.7
CALM	.9						.9	.0
TOTAL	3.7	19.6	63.6	13.1			100.0	19.2

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
107	34 KTS	310 DEG	(11 09)

PRECIP
NO. OF DAYS WITH PRECIP: 8 NO. OF DAYS WITH REPORTS/ COMPLETE: 31 PARTIAL: 0
NO. OF OBS WITH PAST OR PRESENT PRECIP: 10 NO. OF WEATHER OBS: 248

JULY — DATA SUMMARY — EB12

AVERAGE LATITUDE 20.0N — AVERAGE LONGITUDE 094.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	22.7	(16 12)	26.3	33.2	(22 15)	244	31
DEWPOINT TEMP (DEG C)	19.3	(02 18)	23.4	27.8	(04 18)	244	31
PRESSURE (MB)	1011.8	(23 00)	1015.8	1021.3	(19 15)	244	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N	1.6	3.3	.8				5.7	6.9
NE	1.6	3.3					4.9	5.5
E	1.2	7.8	4.5				13.5	8.7
SE	1.2	16.9	14.3	.8			33.2	10.5
S	3.2	10.7	7.0				20.9	7.8
SW	1.2	6.6	.8				8.6	6.3
W	2.5	1.6	1.2				5.3	6.1
NW	2.0	2.9					4.9	5.7
CALM	.8						.8	.0
TOTAL	15.2	54.9	28.7	.8			100.0	8.6

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
244	34 KTS	150 DEG	(03 12)

PRECIP
NO. OF DAYS WITH PRECIP: 7 NO. OF DAYS WITH REPORTS/ COMPLETE: 30 PARTIAL: 1
NO. OF OBS WITH PAST OR PRESENT PRECIP: 12 NO. OF WEATHER OBS: 245

AUGUST — DATA SUMMARY — EB12

AVERAGE LATITUDE 20.0N — AVERAGE LONGITUDE 094.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	25.2	(25 21)	29.9	34.6	(14 21)	248	31
DEWPOINT TEMP (DEG C)	20.7	(20 00)	24.1	28.0	(09 15)	248	31
PRESSURE (MB)	1009.3	(29 21)	1013.7	1018.4	(17 06)	248	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N	.8	1.2					2.0	9.6
NE	.4	4.0	1.2				5.6	7.4
E	4.0	10.9	.4				15.3	7.9
SE	4.4	11.7	14.5				30.6	9.3
S	4.0	19.7	17.3	.8			37.9	10.2
SW	1.2	6.5	2.8	.4			9.2	9.2
W	.8	.4	.4				1.6	6.8
NW	.4		.4				.8	8.0
CALM	.8						.8	.0
TOTAL	17.7	46.8	34.7	.8			100.0	8.6

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
248	33 KTS	170 DEG	(28 18)

PRECIP
NO. OF DAYS WITH PRECIP: 10 NO. OF DAYS WITH REPORTS/ COMPLETE: 31 PARTIAL: 0
NO. OF OBS WITH PAST OR PRESENT PRECIP: 13 NO. OF WEATHER OBS: 248

JULY — DATA SUMMARY — EB10

AVERAGE LATITUDE 27.5N — AVERAGE LONGITUDE 089.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	24.6	(13 12)	28.7	34.8	(20 21)	161	21
DEWPOINT TEMP (DEG C)	20.6	(21 00)	23.2	25.5	(04 03)	161	21
PRESSURE (MB)	1012.4	(16 00)	1017.9	1022.4	(18 18)	161	21

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N	3.1	4.3	.6				8.1	6.8
NE	3.8	2.5					6.3	5.5
E	10.6	7.5					18.0	4.2
SE	3.1	4.3	1.2				8.7	5.4
S	3.8	5.6	2.5				13.0	8.3
SW	3.7	7.5	6.2	.6			18.0	9.1
W	9.3	8.7	3.7				21.7	5.8
NW	4.3	2.9					6.8	5.7
CALM	.6						.6	.0
TOTAL	42.2	42.9	14.3	.6			100.0	5.6

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
161	22 KTS	290 DEG	(13 21)

AUGUST — DATA SUMMARY — EB13

AVERAGE LATITUDE 32.5N — AVERAGE LONGITUDE 079.2W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	23.0	(16 21)	27.2	31.3	(20 15)	202	24
DEWPOINT TEMP (DEG C)	19.1	(13 18)	23.6	25.8	(19 15)	202	24
SEA TEMP (DEG C)	27.0	(18 06)	28.1	31.1	(25 21)	202	24
AIR-SEA TEMP (DEG C)	-03.9	(26 18)	-00.9	02.9	(20 18)	202	24
PRESSURE (MB)	1012.1	(19 21)	1019.1	1023.6	(07 15)	202	24

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) 4-	11-	22-	34-	TOTAL %	MEAN SPEED (KTS)
	4	10	21	33	47	347		
N		3.0	5.9				8.9	11.5
NE	3.0	1.0	.5				4.5	4.0
E	1.0	4.0	.5				5.4	6.0
SE	1.0	11.4	6.4				18.8	8.9
S	1.0	9.4	9.9				20.3	10.1
SW	4.5	15.3	12.9				32.7	9.6
W	3.0	3.0	.5				6.4	5.8
NW	1.0	1.5					2.5	5.2
CALM	1.5						1.5	.0
TOTAL	14.9	48.5	36.6				100.0	9.5

NO. OF OBS	MAX WIND SPEED	DIRECTION	(DA HR)
202	17 KTS	240 DEG	(10 12)

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) — NO. OF WAVES OBS: 202

HEIGHT (M)	<1	1-1.9	2-2.9	3-3.9	4-5.9	6-7.9	8-9.9	10.9	MEAN	MAX (DA HR)
% FREQUENCY		66.9	28.7	4.5	.9				1.5M	4.3M (06 18)

PRECIP
NO. OF DAYS WITH PRECIP: 11 NO. OF DAYS WITH REPORTS/ COMPLETE: 25 PARTIAL: 1
NO. OF OBS WITH PAST OR PRESENT PRECIP: 18 NO. OF WEATHER OBS: 202

Table 9

Selected Gale And Wave Observations, North Atlantic

July and August 1974

Starting with this issue, "high waves" have been added as an additional criteria for selecting observations to be included in this listing. See footnote for the wave height criteria.

Vessel	Nationality	Date	Position of Ship: Lat. deg.	Position of Ship: Long. deg.	Time GMT	Wind: Dir.	Wind: Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C: Air	Temperature °C: Sea	Sea Waves*: Period sec.	Sea Waves*: Height ft.	Swell Waves: Dir.	Swell Waves: Period sec.*	Swell Waves: Height ft.
NORTH ATLANTIC		JULY															
SS AMER LEGEND	AMERICAN	3	43.3 N	36.9 W	18	22	40	5 NM	80	1001.2	17.2	13.6	5	8	24	9	13
SS AMER LEGEND	AMERICAN	6	42.6 N	43.9 W	18	29	45	10 NM	28	1009.7	12.8	13.8	6	13	31	10	14.8
SS EXPORT FREEDOM	AMERICAN	6	49.1 N	22.8 W	12	18	40	2 NM		1009.1	13.6	14.3	4	6.3	18	7	6.3
SS SEALAND VENTURE	AMERICAN	7	45.9 N	19.9 W	12	19	35	5 NM	02	1010.8	10.1	13.8	9	19.5			
SS AMER LEGEND	AMERICAN	7	42.4 N	48.9 W	00	32	35	10 NM	02	1014.3	11.7	13.8	6	11.8	31	10	13
SS LIGHTNING	AMERICAN	7	46.8 N	17.1 W	18	17	38	2 NM		1014.0	10.2	14.2	4	6.3	22	7	6
SS AMER LYNX	AMERICAN	7	14.1 N	77.5 W	18	07	35	10 NM	02	1013.2	28.9	28.7	6	10	09	8	13
SS AMER ALLIANCE	AMERICAN	8	32.7 N	29.2 W	18	22	38	5 NM	01	1009.1	14.4	14.4	6	13	22	10	8
MV FALCON LADY	AMERICAN	8	48.6 N	28.4 W	12	34	38	5 NM	18	1009.8	10.2	12.7	5	8	23	8	14.5
SS CHEVRON PELUY	LIBERIAN	9	27.3 N	15.3 W	00	36	M 39	10 NM	09	1014.9	21.3	19.4	6	13	09	8	13
MV FALCON LADY	AMERICAN	13	36.7 N	59.0 W	00	18	35	5 NM	02	1012.2	25.0	21.7	5	6.5	22	< 6	10.5
MV NOSSULP	NORWEGIAN	14	49.2 N	23.0 W	18	25	M 36	2 NM	91	1012.0	16.0	18.0		13			
MV KUHA ORE	LIBERIAN	15	46.9 N	20.3 W	00	22	36	3 NM	20	1016.6	18.0	14.0	9	16.5			
SS MARGARET LYKES	AMERICAN	15	50.1 N	00.0 W	18	18	M 45	5 NM	02	1006.4	13.0	12.3	5	10			
SS EXPORT FREEDOM	AMERICAN	15	49.5 N	17.5 W	12	28	35	5 NM	60	1010.7	13.9	13.0	3	5	28	8	11.5
SS AFRICAN METEOR	AMERICAN	20	37.7 N	69.6 W	18	22	40	< 30 YD	18	1012.0	24.5	21.0	7	13			
SS LASH TURKIYE	AMERICAN	20	39.7 N	61.1 W	12	18	40	5 NM	01	1011.2	24.0	23.4	3	8	20	6	11.5
SS MAUMEE	AMERICAN	20	35.5 N	73.3 W	00	24	38	2 NM	09	1015.6	26.7	26.7	4	8	24	7	13
SS TILLIE LYKES	AMERICAN	22	29.7 N	70.9 W	12	23	35	.25 NM	81	1016.6	23.4	26.7	3	5			
SS JAMES E O BRIEN	BRITISH	23	41.4 N	10.8 W	00	02	M 37	5 NM	02	1017.0	17.3	19.4	4	10.5			
SS JAMES E O BRIEN	BRITISH	29	41.0 N	10.6 W	12	19	M 38	5 NM	03	1020.4	19.1	18.3					
SS SEALAND CONSUMER	AMERICAN	29	28.9 N	79.8 W	00	01	M 48	10 NM	97	1016.9	31.0	29.4	3	5			
GREAT CANES VESSELS																	
SS J L MAUTHE	AMERICAN	2	42.4 N	87.3 W	06	23	M 38	10 NM	13		21.0	14.0					
SS BROAD H VOORHEES	AMERICAN	2	45.3 N	86.3 W	12	21	M 39	5 NM	91		15.0	14.0	8	10			
SS ERNEST R BREECH	AMERICAN	14	45.7 N	82.3 W	12	32	M 42	10 NM	03		18.0	19.0		3			
SS ARTHUR M ANDERSON	AMERICAN	27	47.5 N	87.7 W	18	28	M 35	> 25 NM	00		20.0	14.0	3	3			
NORTH ATLANTIC		AUG.															
SS MAUMEE	AMERICAN	4	39.9 N	54.6 W	00	11	40	2 NM	51	1008.5	10.0	8.3	10	13	13	>13	19.5
SS LESLIE LYKES	AMERICAN	5	36.2 N	11.6 W	00	03	38	10 NM	02	1018.0	20.0	20.0	3	3	10	7	6.3
SS OCEANIC	PANAMANIAN	10	39.4 N	73.8 W	06	09	M 36	8 NM	81	1016.0	21.1	23.9	4	5			
SS SEALAND VENTURE	AMERICAN	12	40.5 N	64.1 W	18	06	41	10 NM	02	1013.9	22.8	23.9			08	7	8
SS LIGHTNING	AMERICAN	13	45.3 N	28.6 W	18	26	39	5 NM	02	992.3	15.4	17.2	4	5	27	7	11.5
USNS PECOS	AMERICAN	14	38.6 N	64.8 W	06	25	40	5 NM	82	1009.1	23.3	24.4					
SS EXXON WASHINGTON	AMERICAN	15	15.5 N	69.0 W	12	10	35 (A)	10 NM	02	1017.0	28.0	28.3	3	10			
SS LASH ESPANA	AMERICAN	15	39.3 N	50.0 W	18	23	M 35	10 NM	03	1020.7	26.1	26.4			23	6	6.3
SS PRES GRANT (NEW)	AMERICAN	15	13.5 N	77.5 W	18	08	40	5 NM	02	1014.0	27.8	27.8	5	10	08	9	19.5
PRES JOHNSON	AMERICAN	16	13.7 N	77.5 W	18	06	35	5 NM	03	1009.8	28.3	27.8	4	6.5	08	8	10.5
SS TRENTON	AMERICAN	16	13.2 N	75.0 W	12	06	35	10 NM	03	1011.2	26.7	26.7	4	10	06	10	10
SYLVO	NORWEGIAN	17	45.8 N	25.9 W	06	21	36	2 NM	82	1020.0	17.8		3	8			
SS PERRYVILLE	AMERICAN	17	14.4 N	81.6 W	12	06	30	5 NM	09	1013.9	27.8	30.0	4	10.5	09	8	38.5
PRES JOHNSON	AMERICAN	17	13.5 N	76.8 W	00	07	35	5 NM	03	1011.2	27.2	27.8	4	6.5	08	6	11.5
SS SAN FRANCISCO	AMERICAN	17	36.6 N	09.4 W	12	35	35	10 NM	02	1019.3	18.8	21.1	6	10			
SS PERRYVILLE	AMERICAN	18	12.0 N	81.2 W	00	04	13	5 NM	09	1011.9	28.2	27.8	4	8	09	9	32.5
SS SEALAND VENTURE	AMERICAN	24	46.7 N	32.3 W	18	34	40	5 NM	28	1013.5	19.3	18.0	3	5	24	6	11.5
SS AMER ARGOSY	AMERICAN	25	32.9 N	21.1 W	00	25	40	10 NM	01	1020.3	11.2	13.4	3	5	25	6	11.5
SS SEALAND VENTURE	AMERICAN	28	30.6 N	69.5 W	06	32	35 (B)	10 NM	01	1013.9	25.0	28.3	3	8	27	< 6	8
SS RUTH LYKES NEW	AMERICAN	28	48.0 N	19.0 W	18	32	36	10 NM	01	1018.4	14.0	16.1	3	5	32	10	14.5
SS SEALAND MC LEAN	AMERICAN	28	49.9 N	17.9 W	12	28	35	10 NM	01	1012.0	15.0	15.6	5	13	33	8	13
USCGC WESTWIND	AMERICAN	28	55.9 N	49.4 W	06	18	M 36	5 NM	07	1000.9	10.0	14.4	3	6.5	22	< 6	10
SS RUTH LYKES NEW	AMERICAN	29	47.8 N	21.0 W	00	32	36	10 NM	02	1023.4	13.4	16.1	3	6.5	32	8	10
CHERRY VALLEY	AMERICAN	30	19.6 N	68.5 W	18	05	40 (C)	1 NM	82	1013.5	28.4	27.8	8	6.5	05	10	8
MV CECILIE MAERSK	DANISH	31	49.2 N	08.4 W	00	34	38	5 NM	09	1002.0	16.8	16.0	5	11.5			
OCEAN STATION VESSELS																	
ATLANTIC M																	
USCGC TANEY	AMERICAN	10	38.0 N	71.0 W	21	04	36	5 NM	18	1013.9	23.8	23.8	7	13			
USCGC TANEY	AMERICAN	11	38.0 N	71.0 W	00	03	38	5 NM	18	1013.6	23.0	23.2	7	14.5			
GREAT CANES VESSELS																	
SS WILLIAM A IRVIN	AMERICAN	5	44.6 N	86.3 W	00	33	M 39	> 25 NM	02		14.0	21.0	5	5			
SS ERNEST R BREECH	AMERICAN	31	47.4 N	87.5 W	06	26	M 37	10 NM	02		12.0	12.0	3	6.5			
SS ARTHUR M ANDERSON	AMERICAN	31	45.8 N	85.2 W	12	28	M 36	> 25 NM	00		13.0	18.0	2	6.5			
SS J L MAUTHE	AMERICAN	31	47.4 N	89.2 W	06	27	M 40	10 NM	03		13.0	12.0					

\+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

(A) Tropical Storm Alma
(B) Hurricane Becky
(C) Hurricane Carmen

NOTE: The observations are selected from those with winds ≥ 34 kt or waves ≥ 25 ft from May through August (≥ 41 kt or ≥ 33 ft, September through April). In cases where a ship reported more than one observation a day with such values, the one with the highest wind speed was selected.

Table 10

Selected Gale And Wave Observations, North Pacific

July and August 1974

Starting with this issue, "high waves" have been added as an additional criteria for selecting observations to be included in this listing. See footnote for the wave height criteria.

Vessel	Nationality	Date	Position of Ship Lat. deg.	Long. deg.	Time GMT	Wind Dir.	Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperatures °C Air	Sea	Sea Waves* Period sec.	Height ft.	Swell Waves Dir.	Period sec.*	Height ft.
NORTH PACIFIC		JULY															
SS PITTSBURGH	AMERICAN	1	37.6 N	124.4 W	12	34	33	8	NM	02	1012.3	12.4	12.8				
SS AMER LARK	AMERICAN	1	37.2 N	124.3 W	18	32	M 36	5	NM	01	1012.5	15.6	16.4				
MV ARAWAK	AMERICAN	1	18.4 N	134.2 E	18	20	60 (G)	1	NM	33	998.5	24.0	27.0	10	26		
MV PLUTOS	GERMAN	2	37.9 N	123.5 W	18	33	40	10	NM	09	1013.0	14.9	13.9	6	6.5	XX	X	26
SS TRANSONTARIO	AMERICAN	2	39.9 N	125.4 W	12	33	35	10	NM	01	1013.2	13.4	12.7	6	6.5	34	10	14.5
SS AVILA	AMERICAN	2	38.0 N	123.2 W	06	30	35	2	NM	05	1006.8	12.6	8.3	4	11.5	35	< 6	11.5
SS HAWAIIAN ENTERPRISE	AMERICAN	2	36.8 N	125.8 W	00	34	35	5	NM	02	1012.5	14.0	14.4	8	14.5			
GRAND CARRIER	LIBERIAN	2	38.4 N	176.1 E	12	32	40	2	NM	80	1029.8	18.0						
MV PLUTOS	GERMAN	3	38.9 N	128.1 W	00	33	35	10	NM	02	1019.5	14.9	14.0	6	6.5	XX	X	26
SS HAWAIIAN	AMERICAN	3	42.2 N	124.7 W	06	36	37	9	NM	00	1014.9	12.0	11.1					
SS PIONEER MOON	AMERICAN	4	27.6 N	123.0 E	06	02	45 (G)	5	NM	02	994.5	27.8	28.7	6	13	09	12	19.5
SS PRES PIERCE	AMERICAN	4	34.9 N	159.6 E	00	10	M 40	2	NM	28	1007.2	17.8	21.7	7	8			
SS PRES MCKINLEY (NEW)	AMERICAN	4	28.3 N	132.9 E	06	14	35 (G)	10	NM	02	1003.1	28.9	27.8	6	10	20	6	11.5
SS SAN PEDRO	AMERICAN	4	23.8 N	128.8 E	18	16	38 (G)	3	NM	02	994.2	27.8	29.7	6	8	19	12	16
SS AMER LEGION	AMERICAN	4	27.7 N	128.4 E	18	07	83 (G)	.5	NM	82	980.0	25.6	27.6					
SS NANCY LYKES	AMERICAN	4	26.0 N	123.6 E	21	05	40 (G)	5	NM	02	998.2	24.4	26.7	5	6.5	02	8	10
SS AMER LEGION	AMERICAN	5	28.2 N	127.7 E	00	14	70 (G)	.5	NM	82	987.1	25.6	27.2		26			
SS NANCY LYKES	AMERICAN	5	25.7 N	128.8 E	00	09	50 (G)	5	NM	80	998.2	25.6	27.8			29	8	10
SS SEALAND COMMERCE	AMERICAN	6	35.7 N	143.0 E	06	09	38	2	NM	10	1009.5	23.3	21.1	4	8	22	6	8
SS SEALAND GALLOWAY	AMERICAN	6	43.5 N	153.4 E	06	34	35	10	NM	02	1016.0	10.0	10.0	6	11.5			
MV ROSE	LIBERIAN	6	35.2 N	148.8 E	06	10	M 41	.25	NM	81	1011.0	22.8	27.0					
SS PRES PIERCE	AMERICAN	8	38.5 N	179.8 E	00	31	M 38	5	NM	02	1013.2	21.1	17.8	5	6.5	21	7	10
MV TRANSOCEAN TRANSPORT	PHILIPPINE	9	38.0 N	152.4 E	12	14	M 40	.25	NM	40	1008.2	19.0	20.6	8	11.5	14	12	11.5
MV TRANSOCEAN TRANSPORT	PHILIPPINE	10	39.0 N	156.7 E	00	15	M 40	200	YD	80	1004.2	16.5	16.8	12	14.5			
SS PITTSBURGH	AMERICAN	11	40.2 N	163.0 E	12	21	43	5	NM	18	993.0	12.2	12.2	4	6.5	XX	X	13
MV BELMUDSON	BRITISH	11	39.3 N	159.3 E	06	34	M 40	10	NM	02	998.0	16.0	19.0	5	11.5	33	8	16.5
MV CORNELIA MAERSK	DANISH	11	38.4 N	164.1 E	12	27	35	5	NM	02	997.2	16.7	19.2	7	16.5			
MARITIME FORTUNE	PANAMANIAN	11	48.6 N	170.0 E	18	09	M 47	.5	NM	83	996.0	10.0	19.0	7	11.5	09	12	24.5
SS ORIENTAL EXPRESS	AMERICAN	11	34.2 N	138.7 E	06	27	35	200	YD	80	1004.7	23.3	26.7	5	14.5	27	8	18
SS PITTSBURGH	AMERICAN	12	39.6 N	160.7 E	00	32	40	5	NM	02	1003.0	12.2	12.8	4	8	32	9	23
MV CORNELIA MAERSK	DANISH	12	38.4 N	168.5 E	00	27	40	5	NM	80	1001.6	17.8	18.0	7	18			
MARITIME FORTUNE	PANAMANIAN	12	46.7 N	162.2 E	18	28	M 38	2	NM	30	994.0	7.5	19.0	5	10	29	12	34.5
MARITIME FORTUNE	PANAMANIAN	13	48.3 N	159.0 E	06	27	M 24	5	NM	02	1008.0	8.0	19.0	5	8	27	9	29.5
SS PRESIDENT MADISON	AMERICAN	16	39.9 N	157.2 E	12	34	M 38	5	NM	02	992.5	14.4	12.8	4	6.5			
SS TEXAN	AMERICAN	16	18.5 N	103.9 W	00	13	35 (F)	5	NM	02	1009.2	28.9	30.0	8	16.5			
SS PENNMAR	AMERICAN	17	21.4 N	108.1 W	18	10	35 (F)	10	NM	02	1011.2	26.5	25.6	3	5	17	13	13
SS PRESIDENT MADISON	AMERICAN	17	37.8 N	148.8 E	06	35	M 38	10	NM	02	1008.0	17.8	20.0	6	8			
MV TIJUCA	NORWEGIAN	17	17.5 N	108.0 W	00	31	50 (F)	2	NM	83	1002.0	25.5	30.0	14	29.5			
MV EASTERN BUILDER	LIBERIAN	18	30.8 N	177.1 W	18	25	M 35	2	NM		1006.0	13.0	10.0	5	8	25	9	16.5
SS LYMAN HALL	AMERICAN	18	20.4 N	112.5 W	00	36	35 (F)	5	NM	02	1004.4	26.5	26.5	7	10	09	8	13
MV MARGARET JOHNSON	SWEDISH	18	22.8 N	110.7 W	18	10	35 (G+)	10	NM	01	1012.5	26.5	24.5	6	5	-22	7	10
MV TIJUCA	NORWEGIAN	18	17.6 N	110.2 W	18	20	40 (G+)	.5	NM	83	1014.0	23.5	29.0	12	16.5			
SS TAIPING	GERMAN	18	19.8 N	111.4 W	18	27	50 (G+)	.5	NM	80	1004.0	24.2	27.2			27	9	14.5
MV VAN ENTERPRISE	LIBERIAN	18	30.7 N	171.9 W	18	33	35	5	NM	05	1007.0	13.0	8.0	10	10	23	8	13
SS AMER LEGION	AMERICAN	19	22.7 N	114.9 W	09	14	40 (G+)	2	NM	80	1009.0	22.2	20.0	6	13			
MV MARGARET JOHNSON	SWEDISH	19	23.8 N	112.4 W	00	09	38 (G+)	10	NM	02	1008.3	25.2	20.6	7	10			
SS AMER CHALLENGER	AMERICAN	20	20.1 N	121.2 E	18	11	45 (I)	10	NM	02	1004.1	28.3	29.4	12	14.5			
SS PENNMAR	AMERICAN	20	14.2 N	98.3 W	06	05	40	10	NM	01	1015.2	29.0	28.3	3	6.5			
SS J L HANNA	AMERICAN	22	31.1 N	129.5 W	03	13	35	10	NM	02	1014.3	11.1	12.8	2	6.5	13	6	8
SS IDAHO STANDARD	AMERICAN	24	40.2 N	126.3 W	12	33	38	9	NM	02	1016.9	13.6	16.1	5	10	34	8	11.5
SS J L HANNA	AMERICAN	24	39.8 N	124.3 W	03	31	35	> 25	NM	02	1013.0	13.6	8.9			31	< 6	13
MV DERWENTFIELD	BRITISH	25	27.7 N	156.0 E	12	05	40	> 25	NM	03	1007.5	25.0	28.0	5	16.5	04	6	19.5
GOLDEN EXPLORER	LIBERIAN	28	45.9 N	175.8 E	00	19	M 37	.5	NM	49	992.0	12.5	9.0	4	8	19	10	23
SS PACIFIC BEAR	AMERICAN	28	49.6 N	179.7 W	18	03	38	.5	NM		1001.7	11.1	9.4	5	8	18	8	16
SS WASHINGTON MAIL	AMERICAN	29	54.4 N	169.2 W	00	30	43	10	NM	01	1009.2	12.8	9.4	7	8			
SS NORSH TRANSPORTER	NORWEGIAN	31	41.5 N	153.4 W	12	24	35	10	NM	03	1011.0	14.2	18.0					
NORTH PACIFIC		AUG.																
SS SEALAND GALLOWAY	AMERICAN	4	40.5 N	127.2 W	00	36	35	5	NM	02	1014.2	16.7	15.0	6	10	34	8	16.5
MV OE STEIGUER	AMERICAN	8	38.2 N	126.2 W	18	34	M 35	10	NM	02	1015.6	17.2	16.7	4	6.5	34	8	19.5
SS OVERSEAS ALEUTIAN	AMERICAN	9	36.1 N	125.5 W	00	32	36	10	NM	03	1014.6	16.8	15.7	3	10			
SS GREEN WAVE	AMERICAN	9	17.7 N	120.0 E	06	24	40 (L)	10	NM	21	999.2	28.8	30.6	5	10	24	8	11.5
SS WALTER RICE	AMERICAN	9	39.9 N	124.9 W	06	32	40	9	NM	00	1010.8	15.0	10.7			33	7	13
MV NORSH ELITE	NORWEGIAN	10	11.4 N	139.5 E	12	27	37	5	NM	02	1004.0	29.0	30.0	6	8			
SS ST LOUIS	AMERICAN	10	40.9 N	179.3 W	12	01	37	10	NM	02	1030.0	10.7	10.2	3	5	04	7	6.5
MV EMMA JOHANNA	GERMAN	11	52.7 N	177.2 E	09	12	45	2	NM	43	1003.5	10.2	9.4	XX	13			
MV NORSH ELITE	NORWEGIAN	11	09.5 N	135.9 E	06	26	35	2	NM	82	1003.5	27.0	30.0	9	8			
MV MAMMOTH PINE	LIBERIAN	11	52.1 N	174.8 E	12	20	M 35	.5	NM	30	999.0	9.0	10.0	7	13			
SS TRANSCHAMPLAIN	AMERICAN	11	12.0 N	134.0 E	12	25	40 (H)	5	NM	82	1002.4	27.8	30.8	8	14.5			
SS ST LOUIS	AMERICAN	11	39.4 N	133.3 W	06	03	35	10	NM	02	1023.5	16.7	16.7	3	5	03	7	10
MV GOLDEN LIGHT	LIBERIAN	12	52.3 N	173.4 E	12	23	M 38	1	NM	40	992.2	11.5	11.0	6	11.5			
SS TRANSCHAMPLAIN	AMERICAN	12	12.4 N	131.3 E	12	24	35 (H)	10	NM	13	1004.7	28.3	30.6	7	11.5			
USCGC MUNRO	AMERICAN	13	54.4 N	163.9 W	12	19	40	1	NM	07	1018.5	11.5	8.0	5	3	18	6	5
SS TRANSCHAMPLAIN	AMERICAN	13	13.1 N	147.9 E	12	23	35 (H)	10	NM	25	1004.7	23.6	30.6	7	10	25	9	13
SS AMER CHALLENGER	AMERICAN	15	32.8 N	139.2 E	06	06	36	10	NM	03	995.9	29.4	27.8	6	10	11	11	19.5
SS CHEVRON TRANSPORTER	LIBERIAN	15	13.4 N	136.3 E	06	27	35	5	NM	02	1004.5	24.5	28.9			28	X	8
MV JESSIE STOVE	NORWEGIAN	15	19.2 N	128.8 E	12	33	50 (H)	10	NM	82	1003.0	26.2	29.0	6	26			
MV JAPAN ACE	JAPANESE	15	42.5 N	153.1 W	12	09	M 40	1	NM	85	1013.5	17.0	14.5	6	10			
MV JESSIE STOVE	NORWEGIAN	16	10.5 N	128.5 E	06	30	35	10	NM	03	1007.5	29.0	29.0	6	16.5			
MV JELA TOPIC	LIBERIAN	17	33.0 N	134.1 E	12	08	35 (H)	5	NM	07	1002.0	28.0	28.0	10	13			
SS HAWAII	AMERICAN	17	26.1 N	129.0 E	00	27	35 (H)	2	NM	21	990.9	27.2	29.4	3	10	27	9	21
SS WASHINGTON	AMERICAN	17	32.7 N	133.5 E	00	06	M 42 (H)	2	NM	30	994.7	28.3	28.9	3	8	06	7	10
MV ASIA BRAVERY	LIBERIAN	18	49.4 N	177.7 E	06	06	M 35	< 30	YD	11	992.5	12.5	10.0	6	32.5	04	6	26
SS AMER LYNX	AMERICAN	18	29.5 N	130.8 E	06	14	55 (H)	5	NM	38	988.2	28.3	27.8	14	32.5	36	10	23
MV PENNLAKE	NORWEGIAN	18	15.3 N	93.0 W	12	36	40	10	NM	03	1010.6	29.5	31.0			38	8	10
TARONGA	NORWEGIAN	18	32.9 N	178.5 E	18	22	35	> 25	NM	25	1006.0	27.0	28.0	8	16.5			
SS SAN PEDRO	AMERICAN	18	27.8 N	127.2 E	12	25	45 (H)	1	NM	82	998.0	26.7	28.4	6	13	34	8	26
SS PRES PIERCE	AMERICAN	18	33.5 N	179.7 E	12	27	38	5	NM	25	1004.6	25.0	24.4	5	6.5	27	8	10

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. pp	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Wave† Period sec.	Sea Wave† Height ft.	Swell Waves Dir. pp	Swell Waves Period sec.*	Swell Waves Height ft.
NORTH PACIFIC OCEAN		AUG.															
MV LOUIS MAERSK	DANISH	18	35.8 N	158.8 E	18	28	40	9 NK	09	1001.0	24.0						
SS SAN PEDRO	AMERICAN	19	30.1 N	127.0 E	00	12	40 (SE)	2 NK		992.9	28.9	28.9	5	13	18	9	24.5
SS PRES TAFT /NEW/	AMERICAN	19	47.6 N	169.8 W	12	14	35	2 NK	07	1007.2	13.5	11.2	3	8			
SS PRES PIERCE	AMERICAN	19	33.0 N	170.5 E	12	25	40	10 NK	02	1001.3	25.6	24.4	7	8	27	8	11.5
MV ASIA BRAVERY	LIBERIAN	19	30.0 N	179.2 W	12	12	N 30	200 YQ	46	998.8	13.0	10.0			18	7	32.5
MV WORLD PELAGIC	LIBERIAN	20	31.7 N	171.0 W	12	16	35	200 YQ	48	1006.5	14.0	12.0	8	16.5			
MV ASIA BRAVERY	LIBERIAN	20	49.9 N	171.1 W	00	14	N 30	200 YQ	44	1004.8	10.4	11.0			14	8	29.5
MV CRESSIDA	PANAMANIAN	20	30.8 N	169.7 W	18	09	N 45	9 NK	02	1007.0	12.0	11.0	8	13			
SS DRAGON MAIL	AMERICAN	21	49.8 N	178.7 W	12	29	45	2 NK	10	1004.1	10.0	7.8	3	6.5	29	11	8
MV PLUVIUS	GERMAN	22	37.1 N	159.5 E	06	30	37	9 NK	01	999.0	23.4	23.2	5	13	24	8	23
SS SANTA MARIA	AMERICAN	23	38.2 N	123.3 W	00	30	35	10 NK	07	1014.2	16.7	16.7	5	6.5	31	9	10
SS PRES PIERCE	AMERICAN	24	26.0 N	127.7 E	06	29	45 (M)	30 YQ	48	989.1	27.8	26.3					
SS AMER LYNX	AMERICAN	24	35.4 N	150.0 E	06	20	35	10 NK	03	1010.2	27.8	27.8			20	< 6	6
MV STOLT DRAGON	LIBERIAN	25	36.4 N	149.2 E	12	18	40	10 NK	01	1014.0	27.0	28.0					
SS PRES FILLMORE /NEW/	AMERICAN	25	33.9 N	138.8 E	12	19	40 (SE)	9 NK	02	1003.1	29.6	29.7	6	16.5	24	6	16.5
SS PRES FILLMORE /NEW/	AMERICAN	26	34.7 N	143.9 E	00	18	40	9 NK	02	1012.5	27.8	28.7	6	13	18	7	16.5
MV OCEAN PROGRESS	LIBERIAN	26	23.7 N	148.6 W	18	11	N 40 (F)	9 NK	80	1018.0	21.3	23.0	7	14.5			
SS JAPAN MAIL	AMERICAN	26	36.3 N	142.5 E	06	20	38	9 NK	02	1007.1	27.2	29.3	2	8	20	< 6	13
MV CORVIGLIA	SWISS	26	36.8 N	141.9 E	06	18	37	9 NK	02	1007.5	25.8	26.0	11	19.5			
MV WORLD PELAGIC	LIBERIAN	26	42.2 N	147.5 E	18	21	39	200 YQ	45	1007.0	20.0	17.0	9	16.5	22	12	24.5
MV STOLT DRAGON	LIBERIAN	26	36.3 N	148.0 E	00	16	40	10 NK	00	1019.0	29.0	29.8	7	6.5			
MV JAPAN ACE	JAPANESE	27	43.4 N	157.2 W	18	14	N 44	.5 NK	51	998.0	19.0	14.5	4	6.5	17	8	11.5
SS ARCTIC TOKYO	LIBERIAN	27	48.3 N	166.3 E	18	32	N 36	10 NK	09	1007.5	10.7	12.0	14	16.5			
MV FALCON LADY	AMERICAN	28	22.4 N	148.3 E	18	13	40 (F)	9 NK	02	1004.1	25.5	25.6	3	6.5	14	8	21
MV PRESSIA	PANAMANIAN	28	51.5 N	147.8 W	18	14	N 47	1 NK		1013.0	13.9	13.9	6	13			
MV JAPAN ACE	JAPANESE	28	43.4 N	159.8 W	00	30	N 38	9 NK	14	988.0	18.0	14.0	7	13	19	8	16.5
SS PHIL MAIL	AMERICAN	28	46.4 N	178.2 E	06	32	35	2 NK		986.1	12.2	11.1	5	19.5	32	7	24.5
MV MARGARET CORD	DANISH	28	47.3 N	160.4 W	06	12	45	2 NK	80	981.0	19.0	17.0	6	13	12	8	16.5
SS PHIL MAIL	AMERICAN	28	46.7 N	179.3 W	12	32	47	9 NK	21	981.4	11.7	12.2			32	6	29.5
SS ZIM TOKYO	GERMAN	28	33.6 N	152.5 W	12	31	37	9 NK	03	1008.2	24.3	24.4		10			
MV MARIT MAERSK	DANISH	28	20.2 N	143.3 E	00	02	47 (F)	.25 NK		976.5	28.0	28.0	8	23			
SS SEALAND GALLOWAY	AMERICAN	28	51.0 N	160.0 W	18	16	45	2 NK	07	985.0	13.4	11.1	8	19	16	8	26
SS WASHINGTON	AMERICAN	29	51.5 N	149.1 W	06	13	N 38	2 NK	10	1012.0	13.9	12.2	3	10	11	6	16.5
SS PHIL MAIL	AMERICAN	29	46.9 N	175.1 W	00	36	45	9 NK	81	976.0	12.2	11.7	6	10	27	9	11.5
SS GREEN PORT /NEW/	AMERICAN	29	14.5 N	110.9 W	18	23	30(M+)	9 NK	20	1007.1	28.7	28.3	5	16.5	28	7	24.5
SS SEALAND COMMERCE	AMERICAN	29	39.0 N	174.6 W	00	29	40	10 NK	02	999.0	17.2	16.7	5	19.5			
MV FALCON LADY	AMERICAN	29	21.7 N	144.9 E	06	16	40 (F)	9 NK	25	1003.0	26.3	24.4	6	13	21	8	23
SS GREEN PORT /NEW/	AMERICAN	30	13.4 N	107.5 W	06	23	30(M+)	10 NK	01	1009.1	24.5	28.0	5	11.5	29	7	24.5
SS SUMMIT	AMERICAN	30	32.6 N	179.2 W	06	29	35	2 NK		990.0	8.9	7.2	4	8	36	9	13
SS PHIL MAIL	AMERICAN	30	49.5 N	164.6 W	00	20	39	10 NK	25	993.9	14.4	12.2	6	14.5			
MARCONA PATHFINDER	LIBERIAN	30	32.7 N	137.5 E	18	07	35 (F)	5 NK	81	993.3	26.7	28.9	4	6.5	07	8	19.5
SS SAN PEDRO	AMERICAN	30	26.9 N	128.2 E	06	32	40 (R)	2 NK	80	994.9	27.2	28.3	3	6.5	33	10	19.5
MARCONA PATHFINDER	LIBERIAN	31	30.4 N	139.7 E	12	31	44 (F)	.5 NK	03	993.0	25.0	28.3	4	6.5	27	8	16.5

\+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

(G) Typhoon Gilda
(I) Typhoon Ivy
(L) Tropical Storm Lucy
(M) Typhoon Mary
(N) Tropical Storm Nadine
(P) Typhoon Polly
(R) Tropical Storm Rose
(F) Hurricane Francesca
(G+) Hurricane Gretchen
(M+) Hurricane Maggie

NOTE: The observations are selected from those with winds ≥ 35 kt or waves ≥ 25 ft from May through August (≥ 41 kt or ≥ 33 ft, September through April). In cases where a ship reported more than one observation a day with such values, the one with the highest wind speed was selected.

(Continued from page 41.)

A disturbed area near 10°N, 105°W, at 1200 on the 25th, became a depression by 1800 as indicated by the USNS SEA LIFT and PDOG. These reports suggested a closed circulation and a low central pressure. The depression intensified to tropical storm Maggie, at 0000 on the 26th, near 11.5°N, 105°W. Movement was toward the northwest at about 5 kt.

Satellite cameras followed the development to hurricane intensity, at 1800 on the 26th, with 65-kt winds near the center. Further intensification developed winds of 120 kt for an 18-hr period, beginning 0600 on the 28th, after which gradual weakening took place. Air Force reconnaissance aircraft made seven fixes on the storm, reporting wind speeds of 110 kt at 1800 on the 27th, 120 kt at 1800 on the 28th, 115 kt at 0000 on the 29th, 85 kt later on the 29th, and 65 kt on the 30th. Maggie became a tropical storm at 0400 on the 31st, moving westward at about 10 kt, from 19°N, 116°W. Weakening continued for another 42 hr until the storm became a depression, near 20°N, 120°W, with 30-kt winds at 1800, September 1.

The lowest pressure reported on the surface was 999.7 mb at Socorro Island when Maggie was about 60 mi south of the island at 1800 on the 28th. A short time earlier an Air Force reconnaissance plane had dropped a radiosonde into the eye. The lowest pressure measured by it was 934 mb. The observer on board the aircraft reported "extremely strong winds from approximately 5 mi from the center into the eye wall." At that time the eye had a radius of 9 mi and was circular.

Casualties--There were no reports of casualties in the North Pacific other than those associated with tropical cyclones and described above. There was a report of heavy weather damage to the 5,592-ton CANTERBURY STAR in the South Pacific. She encountered heavy weather, on the 14th and 15th, on a voyage from New York to Sydney.

THE MARINERS WEATHER LOG WELCOMES ARTICLES AND LETTERS FROM MARINERS RELATING TO METEOROLOGY AND OCEANOGRAPHY, INCLUDING THEIR EFFECTS ON SHIP OPERATIONS.

Rough Log, North Atlantic Weather

October and November 1974

ROUGH LOG, OCTOBER 1974--The total number of storms that affected the area of the Northern Hemisphere between 100°W and 30°E was well above normal, but only normal for the oceanic area. The storm tracks over water had the appearance of being rotated about 30° counterclockwise with the center of rotation near Newfoundland. The primary storm track out of the midwest, across the Great Lakes, and into the Labrador Sea was near the climatological normal, until it turned more northerly toward Davis Strait. The track off the east coast of the United States was farther east with a more northerly component that took it into the Denmark Strait rather than south of Iceland and into the Norwegian Sea. There were two cyclones that wandered in the Azores area for days. The cyclones over the continent of Europe also tended to move in circular paths. There were several weak cyclones over the central Mediterranean Sea. Hurricane Gertrude extended into this month, but formed in September.

The 30-day mean pressure centers departed more from normal than the cyclone tracks. Normally the Icelandic Low is centered near 63°N, 30°W, at 1002.4 mb. This month there were two centers, a 1006-mb near 62°N, 60°W, and a 1005-mb near 57°N, 20°E. The high pressure centers differed from the climatological mean even more significantly. The long-range climatic mean shows a 1020.2-mb High south of the Azores, near 34°N, 35°W, with two 1018.6-mb subcenters, one centered over eastern Kentucky and the other near Bayonne, France. There were two major high-pressure centers this month, a 1028-mb near 47°N, 19°W, and a 1025-mb in the normal position over eastern Kentucky, both higher than normal.

The major anomaly that affected North Atlantic waters was a positive 16-mb associated with the 1028-mb High, and centered near 53°N, 20°W. Another positive 6-mb center was colocated with the 1025-mb High. The North Atlantic from approximately 15°N northward averaged higher pressure than normal except for the North Sea and a narrow north-south trough along 60°W which averaged zero departure.

The only significant, in fact only, negative anomaly center was a minus 12-mb, centered near the Gulf of Danzig.

The upper-air pattern was becoming more intense with the main Low near the North Pole deepening. The major trough that normally exists over the eastern United States was farther to the east, off the coast, and sharper than usual. This and a ridge over the eastern ocean resulted in northeasterly rather than easterly zonal flow. An upper-air Low was stacked nearly vertically with the surface Low over the Gulf of Danzig. The trough from this Low extended southward across the central Mediterranean Sea.

Extratropical Cyclones -- This was a combination of two LOWs and is being described more for the location and behavior than high winds and waves. On the 1st, a relatively weak LOW (1004 mb) was located near 47°N, 34°W. A HIGH was centered to the northeast near 57°N, 20°W. The CHERTAL found 40-kt east-southeasterly winds and 21-ft swells about midway between the two centers. As this LOW moved north-northeastward, on the 2d, another LOW formed near 47.5°N, 42.5°W and moved southeastward. By 1200 on the 3d, the second LOW was the only remaining cyclonic circulation.

The LOW continued moving southeastward, and, on the 4th and 5th, the center made two cyclonic loops, moving westward and then northwestward in the process, as a high-pressure center to the north moved eastward. At 1200 on the 5th, the pressure gradient between the two centers resulted in gale-force winds. The FORT LA REINE and POINTE ALLEGRE both were buffeted by 40-kt easterly winds and seas, and swells to 20 ft.

The LOW wandered in the area west of the Azores Islands, in association with its cutoff LOW upper-air support, until the 10th. During this time it drifted northward and slowly filled. By the 11th, the upper-air LOW had dissipated and the remaining cyclonic circulation moved toward the African coast.

The first 2 wk of the month were more like summer than winter. Many stable waves formed and dissipated, but very few developed even gale-force winds. Although this LOW developed on the 10th, it was not until the 12th that it concerned shipping. It moved southeastward out of northern Quebec, and the center crossed Newfoundland late on the 11th. At 1200 on the 12th, the 1000-mb center was near 49°N, 47°W, and the ZIM TOKYO was at 42.8°N, 53.6°W, with 45-kt northwesterly gales on her starboard side. The seas were 20 ft. Twelve hours later she still suffered 40-kt gales with 16-ft seas.

The path of the LOW had now turned northeastward and the pressure had decreased rapidly. At 0000 on the 14th, the pressure was 972 mb near 60.5°N, 33°W. At that time the MONT LOUIS was near 56°N, 31°W, or about 300 mi south of the center, sailing into 50-kt blustering winds and 23-ft seas. Off the coast of Labrador the PELICAN was braving 40-kt winds and 26-ft seas. Later that day there were several reports of gale-force winds including 45 kt by the C. P. DISCOVERER with 33-ft seas. On the 15th and 16th, the LOW was moving into the Denmark Strait and filling. Late on the 16th, it had disappeared.

The storm formed near the Kansas City stockyards, on the 13th, behind a HIGH that had moved eastward across the Great Lakes. As the storm moved across the Lakes, on the 14th, gale warnings were posted. By 1200 on the 15th, the LOW was near 54°N, 69°W, at 990 mb. The VGBZ was at the northern tip of Nova Scotia with 40-kt winds. Twenty-four hours later, the 980-mb center was over the Labrador Sea at 59°N, 54°W (fig. 39). The PELICAN was still at the same position off the Labrador coast and fighting 60-kt winds and 31-ft seas.

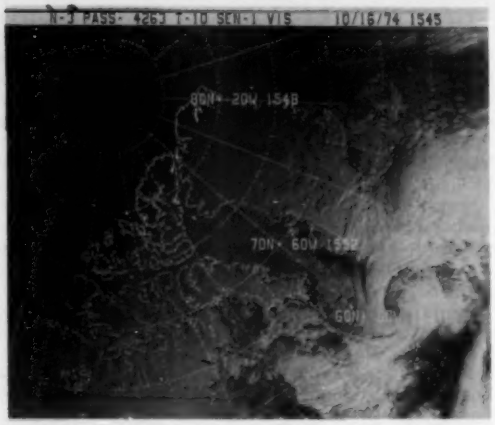

Figure 39. — The center of the LOW appears slightly farther south in this photo than the charts indicated.

Late on the 16th, the surface LOW crashed against the southwest coast of Greenland and broke around the southern tip. At 0000 on the 17th, there were two 980-mb centers, one on each side of the island. Within a matter of hours the west coast LOW disappeared as the upper-air LOW moved eastward. The PELICAN and MONT LOUIS were both reporting 50-kt storm winds. The PELICAN was ravaged by 43-ft seas. At 1200, the NANOK S., near 60°N, 38°W, battled 50-kt winds. The QUEEN ELIZABETH 2 was easily sailing eastward near 51°N, 24°W with 40-kt westerlies.

The surviving LOW continued an easterly track and moved across Iceland on the 18th. The OYOR, at 60°N, 36°W, was contending with 45-kt gales on the 19th, and, as the LOW entered the Norwegian Sea, it stalled and disappeared in a larger circulation centered over the Skagerrak.

A polar front paralleling the U.S. east coast had moved off the coast, on the 16th, and stalled about 300 mi off the coast. An arctic front crossed the coast on the 18th, and by the 20th the two combined and one reinforced the other. On the 19th, a frontal wave formed off northern Florida and moved northeastward. It gained strength rapidly with the combined energies. At 0000 on the 20th, it was 998 mb, near 36°N, 68°W, and generating gale-force winds on the cold side. The CANAL GRANDE near 39°N, 64°W, and the CETRA COLUMBA near 33°N, 71°W, both were hit by 40-kt gales.

The storm raced northeastward and by 1200 was off Cape Sable at 982 mb. The ALERT, between Cape Sable and the LOW's center, was buffeted by 45-kt gales. At 0000 on the 21st, the small intense LOW was centered east of Anticosti Island at 967 mb pressure. For such a deep extratropical LOW it was very small--more like a hurricane. SEDCO I and VGFQ both had howling 40-kt winds. As the storm continued its race northward and entered the Labrador Sea without the friction of land surfaces, the winds increased. The HUDSON, about 160 mi southwest of Kap Farvel, encountered roaring 65-kt east-northeasterly winds. The sea and swell reports appeared to be 43 ft and 49 ft, respectively, but were not clear due to analysis features. The C. P. VOYAGER, near 52°N, 51°W, had 50-kt southwesterly winds and 21-ft seas.

As the LOW moved onto the rugged west coast of Greenland, it rapidly deteriorated, but managed to remain alive until the 23d over Disko Island.

Monster of the Month -- This storm formed, on the 22d, west of the same front that was associated with the storm above, in the wake of a wave that moved northward along the front. In terms of synoptic meteorology, the front had moved very slowly eastward as a large HIGH, centered near the Azores, blocked its progress. Almost immediately gale-force winds were measured both to the north and southwest of the center. By 0000 on the 23d, the 1000-mb LOW was at 35°N, 57°W. Two ships were pounded by 45-kt winds northwest of the center. They were the ATLANTIC CARRIER reporting 16-ft seas and the SUGAR CARRIER reporting 16-ft seas and 26-ft swells. With the price of sugar it is hoped her cargo was safe as she was headed northward toward the market.

For a rather shallow storm, this one generated high winds. At 1200 on the 23d (fig. 40), the 996-mb maelstrom was at 36°N, 58°W. The LESLIE LYKES was about 150 mi north of the center (38.5°N, 57.5°W), and mauled by 65-kt northerly winds, 31-ft seas, and 62-ft swells. Nearby at 38°N, 59°W, the BELVAL was battling a 55-kt storm, but no seas were included. The SUGAR CARRIER, at 35°N, 60°W, had not made much headway as she fought 50-kt northwest winds on her bow. She was reporting 20-ft seas. The storm

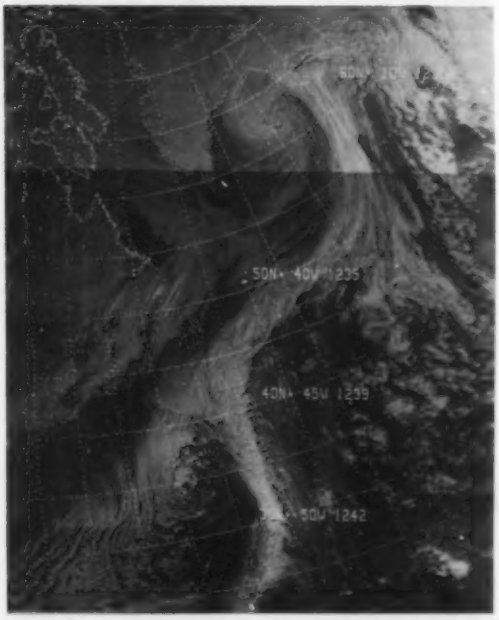

Figure 40. -- Even in the satellite cloud pictures the storm does not appear to be as strong as the winds indicate.

continued moving northward with gale-force winds in all quadrants.

Late on the 24th, a new low-pressure center developed about 240 mi to the north, and another center was analyzed east of Frobisher Bay. On the 25th, all these centers appeared to literally leap toward Kap Farvel and split into two centers on the rocky point. While this was occurring, the LAURENTIAN FOREST contended with 40-kt gales. One low center moved northward up the west coast and the primary low center northeastward up the east coast of Greenland. The FJALLFOSS, near 61°N, 34°W, rocked with 45-kt gales. On the 26th, the storm curved eastward and over Iceland, as the FJALLFOSS sailed eastward with 50-kt westerly winds. No waves were reported. The central pressure was now 972 mb. To the south, Ocean Station Vessel "I" recorded 45-kt winds with 21-ft seas and 18-ft swells. At 0000 on the 27th, both ships had 45-kt winds, but INDIA now had 36-ft seas with a 12-sec period, and 39-ft swells with a 13-sec period. At 1200, the KOMMUNIST, near 60.5°N, 15.5°W, was battered by 50-kt winds and 33-ft seas of 10-sec period. Forty-knot winds were blowing onto the Netherlands coast. The LOW had now moved across the Shetland Islands to the Baltic Sea. The QUEEN ELIZABETH 2 (65,863 tons) was forced across the basin by gales, while leaving her berth at Cherbourg, France, at 2300 on the 27th (fig. 41). She struck the opposite pier and sustained a 10-m-long tear, 5 m above the water. Two longshoremen were injured. The winds were reported to have been 55 kt. At 1200 on the 28th, a Norwegian coastal station west of Oslo came over the circuits as 60 kt. This could have been from the funneling effect of a fjord, or a misprint. Many northern coastal stations were reporting gale-force winds. The LOW moved southeastward into Poland, filling rapidly.

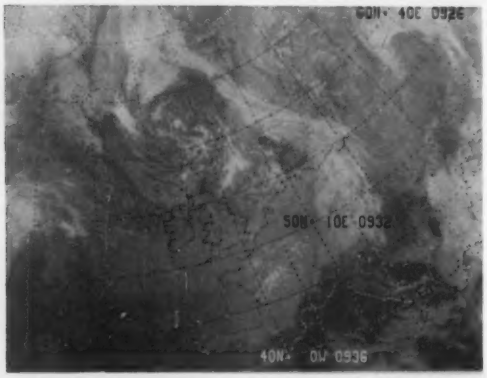

Figure 41.--The white clouds are the high cold clouds and the gray indicates the low warmer clouds in this infrared display.

Casualties--The 11,633-ton Greek tanker EUROPEAN RIVER, 3 mi off Piraeus, was having difficulty making engine repairs due to bad weather. The Greek freighter PANAGIOTIS XILAS (8,764 tons) was in a collision with an East German coastal vessel, in dense fog, near Hamburg Harbor. The 9,268-ton British freighter RUPERT DE LARRINAGA, from Antwerp to Wilmington, N. C., arrived on the 7th with heavy weather damage to hull and cargo. The barge OCEAN 96, in tow of a tug, veered off course in high winds and contacted jetty rocks in St. John's River, near Jacksonville, Fla., on the 21st. The 8,210-ton Greek motor vessel ore carrier TEES ORE ran aground in Orinoco Bay, due to alleged strong winds and current, with a full cargo of iron ore.

ROUGH LOG, NOVEMBER 1974--The storm track pattern was near normal, but the concentrations differed. The number of storms was below normal, but more intense. The primary track across Hudson Bay continued eastward past Kap Farvel rather than into Baffin Bay. The primary tracks along the St. Lawrence River and just off the East Coast were secondary tracks, and the secondary track farther off the coast was a primary track and was continuous to over the northern United Kingdom. Only one major cyclone roamed the Mediterranean Sea.

The 998-mb Icelandic Low was almost identically located with its 1001.8-mb climatological counterpart near 61°N, 30°W. A secondary 1000-mb Low existed, near 62°N, 08°W, resulting in lower pressures over northern Europe and the Scandinavian countries. The Azores High was displaced to the east at 1023 mb. The major center was at 38°N, 18°W, with two 1022-mb subcenters over the Mediterranean Sea. This resulted in higher than normal pressures throughout that area. Pressures over the southeastern United States were above the climatic mean. There were also two distinct areas of low-pressure troughing; one over the Great Lakes and another from Newfoundland southwestward off the U.S. east coast.

The major anomalies corresponded to the pressure centers. A negative 8-mb center was located near the Orkney Islands, with a 5-mb subcenter near 60°N, 30°W. Another negative 4-mb center was near 40°N, 55°W, in connection with the major trough. The positive anomalies were over the Mediterranean Sea--5 mb, a 4-mb center off Lisbon, and a large positive area with a 6-mb center that stretched from northern Quebec over Baffin Island to northern Greenland.

The hemispheric upper-air pattern was basically a large ring with a geometric center near the North Pole. The major Low center affecting the North Atlantic was near 80°N, 100°W. A major trough extended down Baffin Bay, across Labrador, and off the U.S. east coast. Another major trough extended eastward from southern Greenland and then southeastward across the North Sea. A minor trough was over the Midwestern States. The zonal flow was well-developed across the North Atlantic between 35° and 60°N.

There were no tropical cyclones this month.

Extratropical Cyclones--The first storm of the month came across Hudson Bay and on the 1st was over northern Quebec. The VGBZ, west of Cape Breton Island, recorded 40-kt gales. The LOW center moved slowly across the Labrador Sea and, at 0000 on the 3d, had a central pressure of 964 mb. Kap Farvel measured 50-kt northeasterly winds.

To the south, an upper-air cutoff LOW was dissipating and the surface LOW started moving northeastward. As this low-pressure area joined the major

circulation of the northern LOW, the POST CHAMPION and UNION SUNRISE found 40-kt gales east of the center. On the 4th, the southern LOW combined with the frontal system and gale-force winds were blowing between 40° and 55°N east of the front. Kap Farvel now had 60-kt storm winds.

By 1200 on the 4th, the southern LOW could no longer be found in the analysis, but very strong winds were blowing just ahead of the front. Near 46.5°N, 30°W, the POLAR COLUMBIA was fighting 55-kt portside winds with 30-ft seas and 39-ft swells. Farther north, the Y.S. VENTURE, near 54°N, 27°W, reported 50-kt winds, and the H1070 just a few miles south was bucking 45-kt gales and 16-ft seas.

The LOW was moving into the Denmark Strait on the 5th, and the BUNTENSTEIN, near 58.5°N, 34°W, had 40-kt gales and 20-ft seas and swells. The LOW grounded on the Greenland coast on the 6th, and sank on the 7th.

A stationary LOW south of the Denmark Strait started moving eastward, on the 9th, as a perturbation from the coast of Labrador moved into its circulation. By 1200 on the 10th, the disturbance had developed into a small 986-mb LOW, near 54°N, 22°W, south of the main center. The CHERTAL was caught almost in the center with 45-kt gales and 23-ft seas. The small LOW sped northeastward and, by 1200 on the 11th (fig. 42), was the major center of circulation over the Shetland Islands. The CHERTAL, which was moving westward, was now fighting 55-kt winds, near 53.5°N, 25°W, and the seas were a keel-cracking 49 ft. The LOW moved northward off the Norwegian coast, on the 12th, still a large but mild storm. It was filling rapidly, though, and by the 14th was no more.

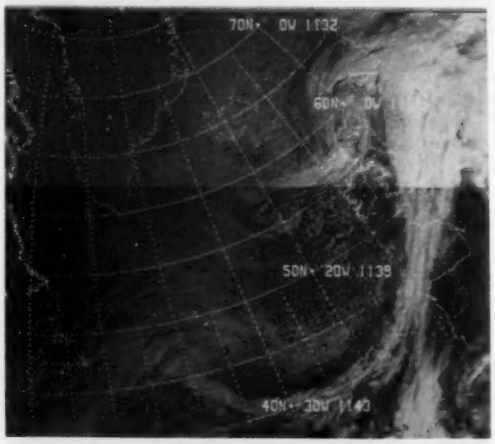

Figure 42. --The high cirrus clouds along the jet stream can be seen crossing the low and middle clouds of the cyclonic circulation near 59°N, 08°E.

This frontal wave formed over the Grand Banks, on the 11th, and moved rapidly eastward. At 1200 on the 12th, it was a 990-mb LOW near 50°N, 27°W. The BRANSFIELD was about 5° latitude to the south with 45-kt gales. During the next 12 hr, the circulation really intensified, although the reported winds did not exceed 40 kt. Ocean Station Vessel "K" was on the edge of the storm, at 0000 on the 13th, with 40-kt gales, but the seas were 26 ft, which is what this storm was noted for. By 1200, there were many 35- to 45-kt wind reports around the southern part of the storm. The H.R. MACMILLAN, near 51.5°N, 20°W, reported 39-ft swells. The BRANSFIELD and KILO were still reporting 26-ft seas and swells toward the outer edges of the circulation.

At 0000 on the 14th, the 956-mb LOW was approaching the northwest coast of Ireland. A ship off Lands End reported 50-kt winds. High seas were being reported in many areas of the large storm. The RED JACKET, near the Azores, measured 28-ft seas and 30-ft swells crashing into her starboard side. The MACMILLAN was battered with 34-ft swells near 48°N, 24°W. Ocean Station Vessel "I" suffered 23-ft swells on the 15th.

As the LOW moved into the Norwegian Sea, it was filling but still maintaining a large circulation. The MAGNUS POSER, far south of the center near 43°N, 25°W, felt the 50-kt effect. On the 15th, a new LOW developed off Cabo Finisterre, and moved into the English Channel. This weakened the LOW considerably and it finally disappeared off the Norwegian coast on the 18th.

Early on the 18th, there was an area of weak gradient between a HIGH over the U.S. Southeast and the main HIGH off the Canary Islands. By 1200, ship reports indicated no doubt of a well-developed 988-mb LOW near 37°N, 57°W. The pressure gradient on the west side of the LOW was much greater than in the other quadrants. The OSSENDRECHT, sailing southwestward, passed just east of the center and, at 0000 on the 19th, was at 37.9°N, 51.9°W with 60-kt storm winds from the northwest. Her pressure had risen 7 mb in 3 hr. The seas were only running at 12 ft, but the swells were 26 ft.

The gale-force winds continued in the southwest and west quadrants and now were more widespread. Far to the southwest of the center, near 33.5°N, 50°W, the DOCEBARRA was headed into 50-kt northwesterlies. At 1200 on the 19th, the VAN TRIUMPH reported only 15-kt winds near the storm's center, but, at 0000 on the 20th, about 300 mi southwest of the center, they were 50 kt. The storm continued its east-northeastward track producing only gale reports. Ocean Station Vessel "K" measured only 35-kt gales as it passed to the north, but the seas were 26 ft. To the southwest, the BOOKER VANGUARD was near 43°N, 20°W, and again only 35-kt west winds were reported, but the swell was 31 ft from the southwest.

The LOW passed over southern England, on the 22d, and decayed rapidly over the North Sea.

This storm's major claim to fame was while it was very young and over the Great Lakes area. It was the result of the combination of two weak low-pressure areas. One formed over the central plains on the lee side of the Rocky Mountains, and the other over the Canadian Provinces of Alberta and Saskatchewan, on the 18th. A high-pressure area was moving off the U.S. east coast and feeding moist air northward ahead of the incipient systems. On the 19th, the two depressions combined, forming a consolidated circulation.

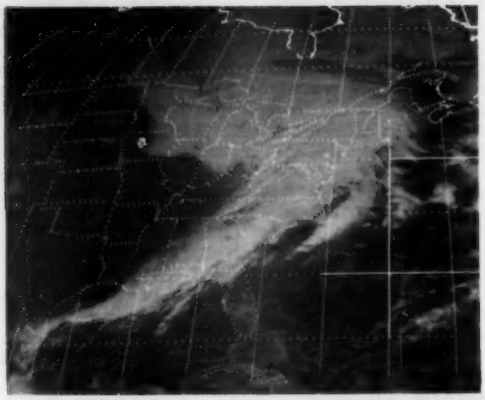

Figure 43.--The vast cloud mass associated with this storm covers the U.S. Northeast, southeast Canada, and the U.S. east coast.

At 1200 on the 20th (fig. 43), the 995-mb LOW was centered over northern Lake Michigan with its cyclone circulation affecting the eastern third of the continent south of the James Bay. By nightfall gales were over the lake area as far south as the Ohio River Valley. On the 21st, storm warnings were in effect for Lake Erie with gale warnings for the remainder of the Lakes. Warnings for beach erosion and flooding were posted for the eastern shore of Lake Erie, with 12-ft waves reported. By 1200, westerly winds of 50 kt and 14-ft seas had been reported. Gales also caused beach erosion and flooding on the eastern shore of Lake Michigan. At that time, the center was off Portland, Maine, and the pressure had dropped to 974 mb. Gale-force winds were now occurring off the Atlantic Seaboard.

At 0000 on the 22d, Ocean Station Vessel "H" measured 40-kt winds and 18-ft seas, which increased to 45 kt and 21 ft, by 1200, with hail. Thunderstorms were being reported by many ships along the trough line behind the front.

This storm was the "exception that proves the rule." When it moved offshore, it started to fill and weaken, rather than deepen and intensify as so frequently happens. Gale-force winds were still blowing in the western half, near the coast. Part of the reason for the weakening was a stubborn HIGH, which was slowly retreating eastward and was blocking the LOW's movement. It continued to move slowly east-southeastward at about 15 kt.

At 1200 on the 24th, the 997-mb LOW was near 39°N, 50°W. The FRUBEL AMERICA, near 37°N, 54.5°W, was pounded by 50-kt winds, 16-ft seas, and 20-ft swells. The EXPORT LEADER and the KRALJEVICA, northwest and southwest of the center respectively, both reported 45-kt gales. The LOW continued southeastward and squeezed between two HIGHs with gale-force winds. Finally the wear and tear was too great, and the storm was spent by the 28th.

A slow-moving front that paralleled the U. S. east coast moved off the coast and over water about 1800 on the 25th. At 0000 on the chart of the 26th, a wave was analyzed near Cape Cod. The GYPSUM EMPRESS was just off the New Jersey coast with 35-kt north-northwesterly winds. By 1200, the storm system was a well-developed 990-mb LOW. There were four reports of 40-kt winds in the southwestern quadrant behind the front. The LAURITA, at 39.4°N, 69.5°W, also reported 30-ft seas. The 984-mb LOW tracked northeastward across the Gulf of St. Lawrence on the 27th. At 0000, the GYPSUM EMPRESS was near Cape Cod with 45-kt winds. At 1200, the VITAUTAS PUTNA, near 42.5°N, 62.5°W, was hit by 55-kt storm winds from the west. As it moved over the cold land and water of the Labrador Sea, it appeared to lose some of its punch, although the central pressure did not change appreciably.

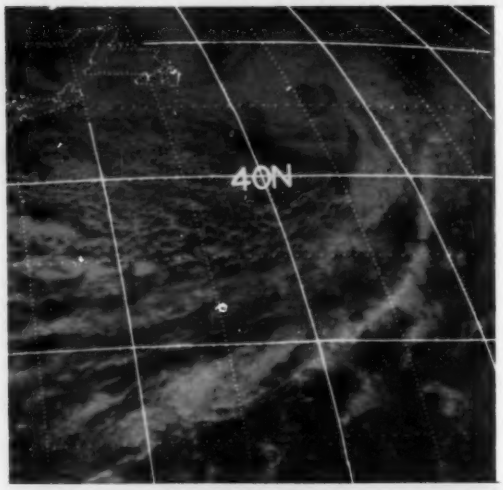

Figure 44. -- The severe storm has moved eastward by midafternoon. The clouds are not as bright as usual because of the high latitude and low sun angle.

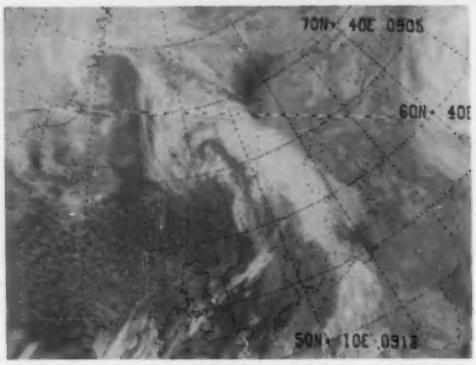

Figure 45. -- The storm did not show on the visual readout because of the early hour (0908 on the 2d) and south declination of the sun. The high clouds show well on the infrared readout.

The eastern third of the United States and the North Atlantic south of 40°N was a large area of flat gradient. There were HIGHs and LOWs, but none were intense. At 0000 on the 29th, a LOW formed near 39°N, 58°W at 1009 mb. The LOW intensified rapidly to 980 mb, at 0000 on the 30th (fig. 44), near 45°N, 48°W. The drilling ship VC8062 was near 47°N, 48.5°W, and reported 70-kt hurricane-force winds with seas and swells of 25 ft. To the southwest of the center, the STOLT LLANDAFF suffered 40-kt northwesterlies. On the 1st, the AMORIA, near 45°N, 41°W, was battered by 60-kt winds and 33-ft swells about 150 mi south of the center.

The storm was racing northeastward and, at 1200 on December 1, was still 980 mb, near 54°N, 27°W. Gales were blowing from south of the storm to across Scotland and Norway. The AMERICAN ACE, near 48.5°N, 30°W, had 45-kt gales on her bow. By 0000 on the 2d (fig. 45), the 973-mb LOW was midway between Iceland and Scotland. The TILLIE LYKES dragged both anchors in strong winds at Firth of Forth, Scotland, at 0130, while loading and discharging barges. Nine barges broke loose, and one went aground and holed. The other eight were salved.

The LOW moved into the Norwegian Sea where it brought gales to the coast of Norway. It continued northward toward Spitsbergen, where it dissipated.

Casualties -- There are no other casualties known at this time.

Rough Log, North Pacific Weather

October and November 1974

ROUGH LOG, OCTOBER 1974--The number of cyclones traversing the North Pacific this month was above normal. The paths they followed were close to the climatological mean in the gross pattern. There were fewer cyclones traveling and forming south of Japan, and these moved easterly rather than northeasterly. There was a favored track from across Hokkaido to south of the Aleutian Islands to the Gulf of Alaska. Few storms entered the Bering Sea and none crossed it from any direction. There were more storms than normal that formed south of the Aleutians between 40° and 45°N, and they formed farther west.

The mean pressure pattern closely matched the climatic mean, except for the central pressures. The Aleutian Low was 998 mb near 57°N, 155°W, or about 240 mi east of the 1002.5-mb climatological position near 58°N, 163°W. The 1024-mb Pacific High was near 36°N, 138°W, only a few miles from the 1019.8-mb climatological location near 34°N, 139°W. The 1020-mb isoline had a bell shape with the handle extending over Vancouver Island. This resulted in a ridge over the Pacific northwest coast.

The anomalies were not exceptionally large, but there were several important centers. A negative 6-mb center was just southeast of Kodiak Island. Another negative 5 mb was centered near 46°N, 180°, reflecting the more southerly track of some storms. The positive anomalies were inland from Cape Navarin (8 mb) and two 6-mb centers were off the U. S. west coast, one near Vancouver Island and the other about 300 mi west of Cape Blanco. There was also a positive 12-mb center north of Point Barrow.

The major differences in the upper-air flow were a displacement southeastward of the Low to over Bristol Bay, and a ridge over Kamchatka and eastern Siberia to an abnormal High centered over the East Siberian Sea.

There were six tropical cyclones, two in the eastern and four in the western ocean. They were hurricane Patricia, tropical storm Rosalie, and typhoons Bess, Carmen, Della, and Elaine.

Extratropical Cyclones--The North Pacific was relatively quiet during the first third of the month. It was also basically during the first half of the month that the storms occurred that developed off Japan and produced the southern storm track. This LOW formed southeast of Tokyo on the 6th. It raced eastward under the zonal flow until the 8th when it started deepening in midocean. At 1200, the LOW was at 42.5°N, 177.5°W with a central pressure of 996 mb (fig. 46). The WAKANESAN MARU, about 150 mi southwest of the center, reported 40-kt gales. This was the storm that forced the crew of the TAI KI to abandon their replica of an ancient Chinese junk in which they had hoped to sail to South America. (See page 31 of this issue.)

The LOW continued moving northeastward, but at a slower pace. There were several reports of gale-

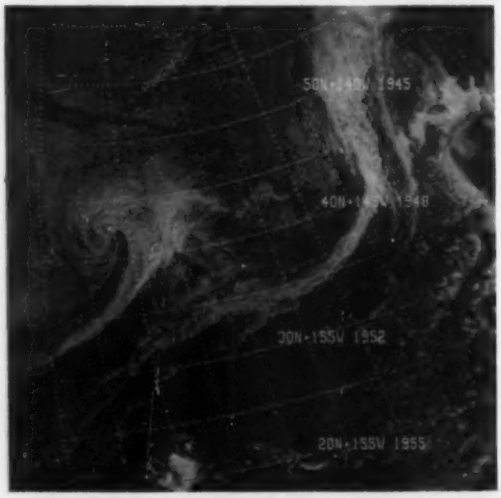

Figure 46. -- This storm has the classical comma shape of an occluded cold front. The white dot near the center is probably a large thunderstorm.

force winds. As the 976-mb LOW moved into the Gulf of Alaska (51.5°N, 147°W), the KING WILLIAM, near 50°N, 149°W, about 100 mi southwest of the center, was battered by 55-kt storm winds at 0000 on the 11th. The seas were coded as 10 ft with swells of 49 ft. About the same distance to the southeast, Ocean Station Vessel "P" measured 40-kt winds and 13-ft seas. The storm turned more northward, maintaining nearly the same pressure until 0000 on the 12th. Twelve hours later, there had been almost explosive filling (998 mb) as the center moved onto the coast. By the 13th only a trough remained.

There was a storm that formed south of Korea, on the 7th, and moved across the southern track. It entered the Gulf of Alaska, on the 15th, with a tightly wound 962-mb center. There were several reports of 45-kt gale winds and two reports of 26-ft waves, on the 15th. No ships were plotted in the area of tightest gradient.

This was a short-lived coastal storm which did not survive the open sea. It formed, early on the 18th, in the Sea of Japan, on a front that extended from near the North Pole, across the Sea of Okhotsk, to North Korea. The storm moved through La Perouse Strait, deepening as it crossed the Sea of Okhotsk. By 1200 on the 19th, the storm had crossed the Kamchatka Peninsula and its central pressure was 974 mb. Island stations along the Kurils reported 35- to 45-kt gales. The DAIGOH MARU was hit by 40-kt winds, far south of the center near 42.5°N, 160°E, and the MEISHON MARU, nearer the center, had 45-kt gales.

The LOW was moving northeastward very slowly with the front moving eastward out ahead of it. At 0000 on the 20th (fig. 47), the highest winds were reported. The 974-mb center was near 54°N, 164°E. About 250 mi south of the center, near 50°N, 166°E, the MONTIRON was fighting 60-kt westerly winds. Far to the south near 42°N, 174°E, and ahead of the front, the HARBOUR BRIDGE was headed westward into 50-kt winds with an obscured sky and heavy drizzle. This was accompanied by 13-ft seas and 20-ft swells.

Later on the 20th, the LOW started filling and became a long/narrow trough stretching southeastward toward another LOW that had been idling in the central ocean. Several ships north of the Aleutians reported gale-force easterly winds. On the 21st, all that remained was a trough that extended westward from the new LOW, near 49°N, 163°W. There was a strong band of winds from the Kamchatka Peninsula to 35°N, south of the center.

The LOW referred to above was also generated on the 18th, in midocean. It quickly developed a good circulation and gale-force winds, by 0000 on the 19th, as the CANADA MARU and MORI MARU could attest. The LOW was moving very slowly east-northeastward. At 0000 on the 20th (fig. 47), the NEBULA was sailing eastward with 40-kt westerlies and 23-ft swells. At 1200, there were no reports, but at 0000 on the 21st, there were many with the 970-mb LOW. The PLUTOS won the award for the highest, at 55 kt, southwest of the center near 44°N, 179°E. Ships as far south as 38°N reported 45-kt winds. Far out east of the center Ocean Station Vessel "P" measured 40-kt southerly winds ahead of the front.

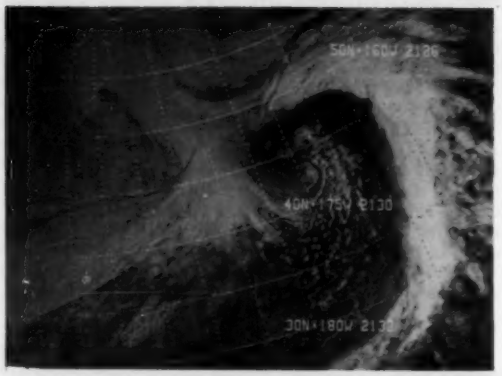

Figure 47.--The surface center of the storm is not clear as it is covered by high clouds late on the 19th. The other storm center is better defined near 43°N, 174°W.

The storm now turned northeastward and deteriorated rapidly as the center moved across the Alaska Peninsula into Bristol Bay.

This contribution from Manchuria originated on an old weak frontal system that had fought its way across the high pressures of the Asian continent. The frontal wave moved over the Sea of Japan on the 20th. At 0000 on the 21st, it was a 986-mb LOW over the Kuril Islands with gales in the southern quadrant. At 1200, the HARUNA MARU was contending with 45-kt strong gales at 41°N, 158°E, while the HOZAN MARU farther west fought 23-ft swells with winds 5 kt lighter.

That was only a taste of what was to come. At 0000 on the 22d, the HOEGH MIRANDA (42.5°N, 171°E) and the ZIM NEW YORK (40°N, 169°E) both fought 50-kt storm winds with thunderstorms and 16-ft seas. At 1200 the highest wind plotted was 45 kt by the TAKAO MARU. This was surely due to a lack of radio officers on duty as the 0000 chart of the 23d was loaded with high wind reports. The highest wind reported for the month was at this time--65 kt from the west-northwest by the EASTERN WORLD--near 45°N, 176°W (fig. 48), with a heavy thunderstorm and hail. Not far away at 44°N, 172°W, the PHILIPPINE MAIL was fighting 60-kt westerly winds combined with 15-ft seas and 28-ft swells. The swells were 40° off the wind seas. About 100 mi directly south of the 956-mb center, the PEARL VENTURE was tossed in all directions by 55-kt westerly winds blowing 13-ft seas and 25-ft swells out of the south. The HOEGH MIRANDA was still battling 55-kt winds. Far out ahead of the storm, the EASTERN BUILDER, near 47.5°N, 156.5°W, was headed south into 55-kt southerly winds. The high winds covered an area of over 1,500 mi in diameter with the greatest concentration in the southwestern quadrant.

On the 24th, the 961-mb LOW was headed toward the Gulf of Alaska. The ALASKA MARU was bounced by 50-kt storm winds. Seas of 10 to 15 ft and swells to 25 ft were common reports south of the center. Later in the day, the center broke up into several centers as it moved toward Kodiak Island. One of these subcenters became the primary circulation over Bristol Bay, on the 25th, where it dissipated.

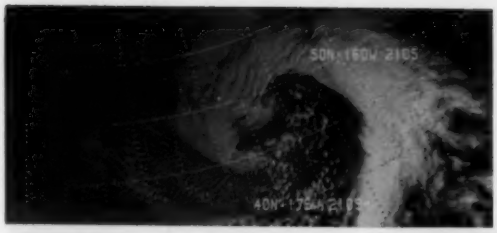

Figure 48. -- Late on the 22d, an area of cloudiness probably associated with maximum vorticity is being advected toward the EASTERN WORLD.

This storm also had Asian ancestry. It came out of North China, across Manchuria, and into the Sea of Japan on the 22d. At 1200, a weather station east of Vladivostok reported 35-kt northerly winds. At this same time another LOW was tracking northeastward from south of Honshu. The first gale-force winds were with this southerly LOW, on the 23d, but at about that time it sped eastward under the influence of the zonal flow.

On the 24th, Ostrov Urup reported 40-kt gales and the DAIKI MARU at 43.6°N, 155.9°E was rocked by 35-kt gales, 12-ft seas, and 16-ft swells. At 1200, the 981-mb LOW was near 45.5°N, 157.5°E. Southwest of the center, near 43.5°N, 154.5°E, the CHIDORISAN MARU was fighting 55-kt starboard winds with 13-ft seas and 23-ft swells. About 150 mi south of the center, the SHINKO MARU, and about 200 mi west of the center another ship, were tossed by 40-kt gales. As the other LOW raced eastward and a HIGH moved off the continent the surface LOW jumped eastward and dissipated into the major cyclonic circulation on the 25th.

This was the LOW, from south of Japan, mentioned in the previous storm account. It formed at 0000 on the 22d, south of Kobe. By 1200 on the 24th, it was moving around the south side of an old LOW over Bristol Bay. During this time it was relatively weak as it raced eastward and then northeastward. It was not until midday on the 26th, when it developed deep upper-air support and slowed in forward speed, that the surface LOW deepened. It treated Ocean Station Vessel "P" to 45-kt gales as it passed about 150 mi to the northwest. At 0000 on the 27th, the 973-mb center (fig. 49) was near 54°N, 144°W, and "PAPA" was still on the receiving end of 45-kt winds with 26-ft seas. The MOBILE, near the coast at 55.5°N, 138°W, had 45-kt southeasterlies north of the occlusion.

The central pressure (970 mb) continued to drop as the storm inched northward at 1200 on the 27th. The USCGC RUSH was about 300 mi south of the center headed northwestward and fighting 60-kt southwesterly winds and 30-ft swells. The seas figure could not be read due to the analysis lines. Southwest of the center the OREGON MAIL had mild 40-kt winds and only 12-ft seas and 16-ft swells. By the 28th, the LOW was filling as rapidly as it deepened. An old quasi-stationary LOW near Bristol Bay absorbed part of the circulation, and on the 29th both LOWs were absorbed by another moving into the Gulf from the southwest.

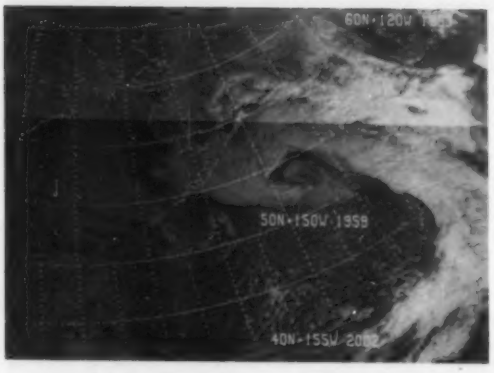

Figure 49.--The cloud pattern of this storm is a good example of the appearance of many in the Gulf of Alaska, with the frontal clouds far ahead of the LOW and piled up against the coastal mountains.

During the later part of this month almost each LOW that entered the Gulf of Alaska was a severe storm. This was the circulation that absorbed the previous storm.

On the 27th, the midlatitudes (25° to 45°N) were dominated by two HIGHs, one near 160°E and the other near 160°W. A LOW formed in the col area between them, near 35°N, 180°. The HIGHs were moving eastward at a fairly high rate of speed and the LOW moved northeastward, deepening and expanding the cyclonic circulation. By 0000 on the 29th, it had a central pressure of 976 mb at 48.5°N, 157.5°W. It had started out at about 1012 mb. The PACIFIC BEAR, at 44.7°N, 162.8°W, was sailing into 45-kt northwesterly winds. Ocean Station Vessel "P" had 40-kt winds from the south, just prior to passage of the cold front. The pressure had dropped 6.8 mb during the past 3 hr. On the 0000 chart of the 30th, there were many ship reports to locate the 954-mb center near 54.5°N, 149°W (fig. 50). The maximum wind reported was 45

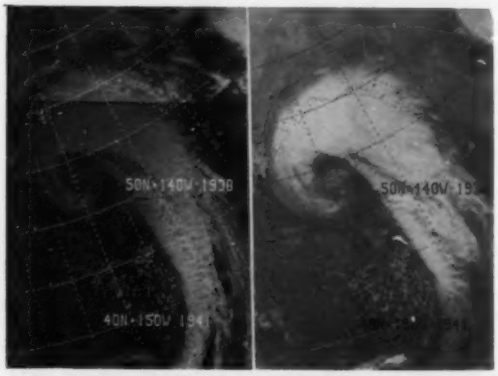

Figure 50. -- The storm as seen by the visual sensor (left) and the infrared sensor (right).

kt by the PACIFIC LOGGER and the WAKANESAN MARU. Waves up to 25 ft were being reported. At 1200, the FYODOR KRAYNOV was near 55°N, 153°W, with 60-kt winds from the northwest. She was also reporting 20-ft seas and 39-ft swells. To the south OSV "P" was still fighting 25-ft seas but the winds were only 35 kt. Near the coast off Yakutat, EB-33 was reporting lighter easterly winds. Later on the 30th, the storm followed the pattern of the others and started to fill rapidly as it neared the coast. On the 31st, there were a few gale-force winds, but by the end of the day a center no longer existed.

This low-pressure system is traceable all the way from the Balkans. On the 30th, it starts to rejuvenate over Manchuria. By 1200 on the 31st, it was a 986-mb LOW over Sakhalin Island. At 1200 November 1, the first gale-force winds were observed. By 0000 on the 2d, the LOW had crossed the Kuril Islands and was 968 mb. At that time, Ostrov Simushir measured 70-kt northwesterly winds. There were two 50-kt ship reports, the DAIKI MARU (44°N, 160.5°E) and the KANEOKA MARU (44.5°N, 158°E). The latter also reported 10-ft seas and 30-ft swells.

At 1200, the island was still measuring 55-kt winds. The GOLDEN ARROW, near 45.5°N, 161.5°E, was slowly traveling southwestward with 45-kt westerly winds, 20-ft seas, and 26-ft swells. To the north of the center, Ostrov Beringa was measuring 50-kt easterly winds. For the last several days there had been indications of a double LOW system, but by the 3d only a single center could be detected. Gale-force winds were blowing from 40° to 55°N and 155°E to 170°W. At this time the 973-mb center was moving eastward almost directly over the Aleutian Islands.

On the 3d, a secondary LOW formed in the southeast quadrant. It moved northeastward into the Gulf of Alaska as the main LOW moved along the islands. By the 5th, the new LOW had taken over the circulation and the original LOW disappeared.

Tropical Cyclones, Western Pacific -- It was black October in the Philippines. In one of the greatest onslaughts in recorded weather history, four typhoons battered Luzon helpless. The island was continually besieged by typhoon winds and torrential rains. When it was all over, more than 1 1/2 million people were left homeless. Crops were so badly damaged that valuable sugar exports were halted. Death and damage figures are still sketchy.

Typhoons are nothing new to the Philippines--they get clobbered almost every year. However, a succession of storms in such a short period of time is unusual. During the previous 21 Octobers, a total of nine typhoons have moved through the Luzon region (15° to 20°N, 120° to 125°E).

All the typhoons were spawned and nurtured in the Philippine Sea. Bess was detected, on the 8th (fig. 51), about 250 mi northwest of Yap Island. She moved west-northwestward, developing slowly. Bess reached typhoon strength, on the 10th, just about 100 mi east of Luzon. Winds of 40 kt were encountered by the AMERICAN LANCER some 400 mi from the huge storm's center. Bess generated 75-kt winds near her center as she moved westward into Luzon early on the 11th. Vigan on the west coast was reporting 45-kt winds

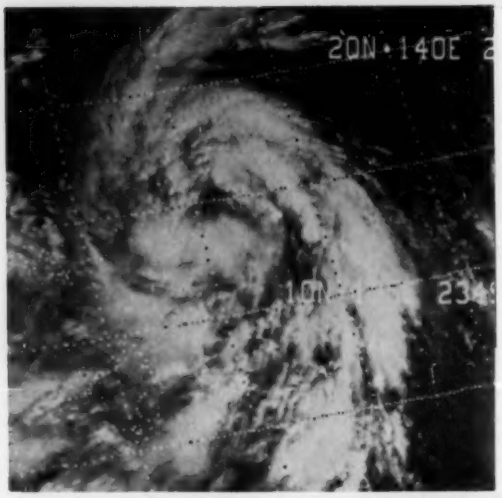

Figure 51.--Beginnings of Bess blanket most of the Philippine Sea on the 8th.

from the north-northwest; they switched to the south-southwest at 45 kt as Bess moved out into the South China Sea. She remained at typhoon strength until the 13th. Then as a tropical storm moving westward she crossed Hainan, and landed on the coast of North Vietnam as a depression on the 14th.

This was the same day that Carmen sprang to life near 12°N, 130°E. Carmen moved northwestward as she intensified. By the 16th, she was a typhoon with 65-kt sustained winds occasionally gusting to about 80 kt. At this time, Carmen was about 200 mi east of Manila and only a little over 100 mi from landfall on the east coast of Luzon (fig. 52). The center of the large circulation moved ashore late on the 16th. She dropped back to tropical storm strength crossing the

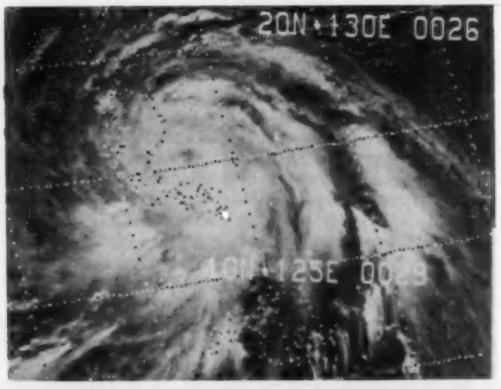

Figure 52.--Carmen winds up to typhoon strength, on the 16th, before visiting the Philippines.

rugged island. However, once over the friendly waters of the South China Sea, Carmen reintensified to typhoon strength by the 17th. She had been moving on a west-northwestward track since coming off Luzon, but, on the 17th, she turned more toward the northwest. Maximum sustained winds built to near 80 kt, with gales extending out 200 to 300 mi from the center, on the 18th. An unidentified ship encountered 50-kt winds within 50 mi of the center as Carmen headed for mainland China. On the 19th, she moved inland about 60 mi west-southwest of Hong Kong.

Two days later, up popped Della, right near Carmen's birthplace. Della developed slowly. She moved northwestward as a tropical storm, until the 22d, when she turned northward and reached typhoon intensity (fig. 53). By this time Della was about 100 mi east of Luzon's northeastern tip. Della suddenly turned westward then west-southwestward, and ploughed through the Babuyan Islands, just off Luzon's north coast, on the 23d. Winds near her center were up to 70 kt, and northern Luzon was pelted with torrential rains blown by 50-kt winds. The typhoon swung westward on the 24th. Maximum winds climbed to 85 kt during the following day. However, Della began to weaken as she neared Hainan late on the 25th. As she crossed the Island, winds dropped to tropical storm strength. She continued westward across the Gulf of Tonkin and moved into North Vietnam near Thanh Hoa--close to where Bess had landed earlier.

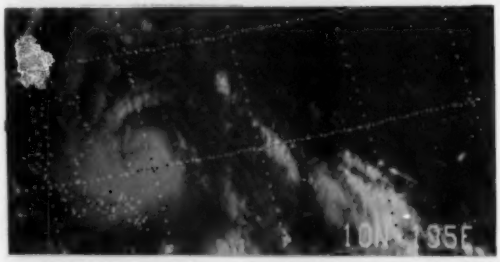

Figure 53.--About to clobber Luzon on the 22d, Della is a small typhoon, which is similar to being a little bit pregnant.

While Della was on her junket through the South China Sea, on the 24th and 25th, Elaine was developing and making her way toward her Luzon rendezvous. Elaine was first detected near 18°N, 140°E. She traveled west-southwestward then westward. On the 26th, Elaine became a typhoon. She intensified rapidly, and the following day 100-kt winds were roaring around her center, which was closing in on Luzon. Elaine crossed the Island, late on the 27th and early on the 28th (fig. 54). Winds were estimated at 90 kt near her center. Over on the west side of the Island, winds of 50 kt were reported on a 6-hourly observation at Vigan. Although she was punished for her overland journey, Elaine was able to sustain typhoon strength. She swung northwestward through the South China Sea on a path reminiscent of Carmen's. However, as the month came to a close, as if on signal, Elaine suddenly slowed and fizzled shortly before reaching mainland China.

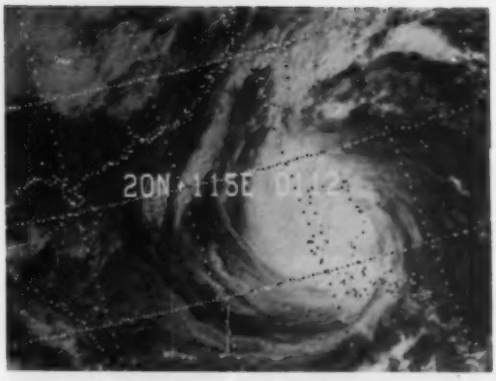

Figure 54.--Elaine gets her shot at Luzon early on the 28th.

Tropical Cyclones, Eastern Pacific--It is extremely interesting to observe tropical cyclone formation and movement using time-lapse ATS-3 photographs. Movie loops are made by making three exposures of each picture taken between 1430 and 2200 on 16-mm motion picture film. When these are joined to form a loop and run through a movie projector, cloud and storm motions are easily seen.

A westward development of a disturbance was noticed late on October 4, near 10°N, 93°W. Between 1500 and 2200 on the 5th, movie loops indicated the disturbance had become better formed between 96°W and 100°W. Definite organization was noticed in the early morning pictures on the 6th, near 10.4°N, 102.4°W, and development to tropical storm intensity occurred, by 0000 on the 7th, with maximum winds of 35 kt near 10.6°N, 104.4°W. Patricia was then moving west-northwestward at 7 to 10 kt.

Further development to hurricane intensity was attained, by 1800 on the 7th, near 12.3°N, 108.5°W (fig. 55). The BRANSFIELD passed a few miles north of

Figure 55.--Hurricane Patricia is about 500 mi southwest of Cape San Lucas with 80-kt winds.

the hurricane during the night of the 9th, but no 0600 or 1200 observations were received and by 1800 she was well west of the center. The TACOMA CITY passed 130 mi south of the hurricane, at 1800 on the 10th, but did not report winds greater than 20 kt when Patricia had 80-kt winds near the center.

Gradual weakening began during the night of the 10th, and the hurricane turned southwestward with a forward motion slowing to about 6 kt. Patricia was downgraded to a tropical storm at 1200 on the 11th, and to a depression at 0600 on the 12th, near 16°N,

123.8°W. She was moving westward and increasing in speed to about 12 kt. Further weakening was indicated, and bulletins were discontinued at 1200 on the 13th. Satellite pictures indicated the remaining cloudiness moved northwestward to 18.5°N, 130°W, by 0000 on the 14th, and then southwestward again.

At 0000 on the 15th, the TROLL RIVER reported southerly winds of 30 kt, and the TRANSCOLUMBIA reported northeasterly winds at 25 kt, 100 mi north of the center. The disturbance continued westward through 0000 on the 17th to 17°N, 143°W, where it entered the easterly trades and was soon lost.

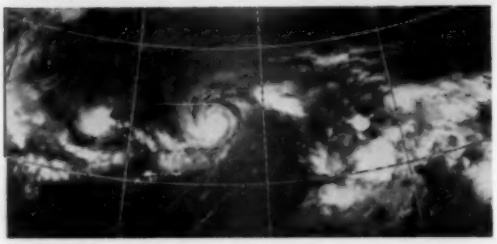

Figure 56. --Tropical storm Rosalie, far from the shipping lanes, is imbedded in the Intertropical Convergence Zone.

Tropical storm Rosalie would not have been observed if it were not for meteorological satellites. The storm formed near 15°N, 133°W, at 1800 on October 20 (fig. 56), and moved westward and southwestward averaging 5 kt, through 1800 on the 23d.

The nearest encounter with shipping was with the MEXICAN GULF, at 0000 on the 22d, while she was headed westward at 14.6°N, 130.5°W, and tropical storm Rosalie was some 200 mi farther west. The MEXICAN GULF altered her course toward the northwest for 24 hr and passed the remains 300 mi north of the center in nearly normal northeasterly trades.

No other vessel reports from the area were received. Maximum winds indicated by satellite pictures were about 55 kt, between 1200 and 1800 on the 21st. The storm was downgraded to a tropical depression, near 13°N, 138°W, at 2100 on the 23d.

Casualties--On the 10th, a tug attempting to reach the 14,488-ton American tanker TROJAN, which was reported holed, failed due to typhoon Bess. The Liberian tanker GOLAR SABANG (9,228 tons) reported heavy weather damage when she arrived at Singapore on the 12th. The 9,055-ton Somali motorship DIAMOND EAGLE went aground at San Fernando, Luzon, during typhoon Bess. The Greek motortanker DEFENDER COLOCOTRONIS (8,821 tons) also reported heavy weather damage on reaching Bombay Harbor.

ROUGH LOG, NOVEMBER 1974--The storm tracks this month were diffuse. There was one path where there was a relative concentration. It was across the Gulf of Terpeniya to the Near Islands and then along the Aleutians into the Gulf of Alaska. The storms that formed south and east of Japan had no favorite path. The primary climatological tracks are from over and east of Japan to the Near Islands, from there toward Bristol Bay, along the Aleutians into the Gulf of Alaska, and south of the Aleutians into the Gulf of Alaska.

The mean pressure pattern closely matched climatology. The Aleutian Low was a flatter oval this month with two centers rather than the 1000.4-mb one. One 996-mb Low was centered near 57°N, 150°W, and the other at 997 mb was near 56°N, 175°E. There were also two High centers versus the normal one at 1021 mb. They were 1023 mb near 33°N, 166°W, and 1022 mb near 33°N, 130°W. The usual large High over central Asia was normal in location and pressure of 1034 mb.

The anomalies were not large. There was a negative 7-mb center over the Sea of Okhotsk and a negative 8-mb center over the Gulf of Alaska. The major positive anomaly was 5 mb centered near 40°N, 170°W.

As with the Atlantic, the upper-air flow was mainly zonal in the mean. There were major troughs located near both coasts, one over the Sea of Japan and the other approximating an arc from Kodiak Island to 45°N, 145°W, to 30°N, 150°W. The major anomaly centers were a negative one over the Sea of Okhotsk and a large positive one over the central ocean--30° to 40°N, 150°E to 150°W.

Extratropical Cyclones--This LOW materialized over Manchuria, on the 2d, and moved over the Sea of Japan on the 3d. On the 5th (fig. 57), it developed a double LOW system that was to persist for several days, which is unusual. The HONDURAS MARU found 40-kt gales near 39°N, 162°E. Later, Ostrov Urup measured 50-kt gales.

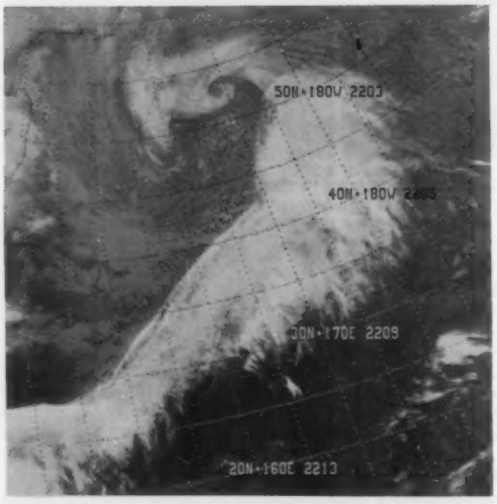

Figure 57. --The double LOW centers can be located near 53°N, 168°E, and 48°N, 160°E.

The 6th was a big day, with gale-force or higher winds all around the center. The YOZAN MARU and ASAHI MARU both reported 50-kt winds and the STAR BILLABONG was ravaged by 25-ft seas and 44-ft swells

near 46.5°N, 168.5°E.

By 0000 on the 7th, the LOW had reached 970 mb, near 53°N, 180°, with ships still fighting gale-force winds. The SAKHALINSKIE GORY in the Bering Sea, at 57.5°N, 174°W, had 45-kt gales. The storm center crossed into the Gulf of Alaska, on the 9th, and a ship was hammered by 33-ft waves at 48.5°N, 165°W. At 0000 on the 10th, the SUMMIT was in Shelikof Strait and was battered by 60-kt near-hurricane-force moving air. After that last effort the storm died fast as another LOW passed to the south and a large HIGH approached from the southwest.

Monster of the Month--On the 11th, there was a broad area of low pressure, with multiple centers, that covered the western two-thirds of the Bering Sea and extreme eastern Siberia. A large 1040-mb HIGH was centered near 45°N, 160°W, and feeding warm moist air into the eastern Bering Sea. By 0000 on the 12th (fig. 58), the pressure had dropped rapidly and consolidated into one large deep LOW (956 mb) off Mys Navarin. Winds up to 40 kt were blowing across island and coastal stations. At 1200 on the 12th, the LOW was 948 mb over the Bering Strait. Nome recorded prevailing winds of 35 kt from the south. A ship north of Saint Paul Island had 45-kt winds and 15-

Figure 58.--Thirteen hours after this orbit, late on the 11th, the LOW was over the Bering Strait

ft seas. Winds as high as 60 kt were reported to have battered the western Alaskan coast. Waves breeched the seawall (fig. 59) and flooded some areas of Nome to a depth of 5 ft. Numerous people were forced from their homes, many of which were damaged. About half the town was without electric power, the sewage system was out, and the water supply suspect. On the 13th, the LOW moved into the Chukchi Sea, and LOWs moving around the southern periphery weakened the gradient over the Bering Sea.

This was a series of short-lived storms that formed

Figure 59.--Waves batter the seawall at Nome and endanger a newly installed communications antenna. Wide World Photo.

on the southern outskirts of the large deep LOW described above. This first storm formed, on the 11th, off Tokyo and raced northeastward. On the 12th, it started to deepen and a ship northeast of the center reported 40-kt winds with a thunderstorm. The H3DQ was slapped by 50-kt winds as the storm roared past. On the 13th, it crashed onto the shore of Bristol Bay.

This vicious cyclone had its inception after 1200 on the 13th. No ships reported anything of consequence until 0000 on the 15th, when it was 968 mb in the Gulf of Alaska. Nearly all ships within 500 mi experienced at least gale-force winds. The SEA FAN was ravaged by 60-kt winds near 54°N, 142°W. The PORTLAND, about 120 mi to the north, combated 55 kt. To the southwest near 53°N, 148°W, the TOWA MARU was sailing into 50-kt winds and 33-ft swells, and the KENJYU MARU, just a few miles away, braved 45-kt winds. As the LOW roared ashore near Montague Island, the HILLYER BROWN was swept by 45-kt gales and 25-ft waves.

The very deep LOW had moved into the Chukchi Sea and another weaker one developed and replaced it in the northern Bering Sea. In a trough lying near 180° another LOW came to life and raced eastward. Within 12 hr it was 990 mb and generating 50-kt winds as reported by the MARUSUMI MARU (46°N, 168°W) and the KASUGAI MARU (47°N, 176°W). The VALENTIN KOTELNIKOV was closer to the Bering Sea LOW, near 54°N, 180°, where she was lashed by 60-kt winds. The NIKOLAY OSTROVSKIY report south of Unimak Island was plotted as 70 kt, but the direction was about 90° from what it should have been, so the speed value may be wrong also. About 120 mi northwest of the LOW, the FYODOR KRAYNOV reported 55-kt winds. In the southern part of the LOW the waves rose over 20 ft. On the 17th, the BURMAH LAPIS encountered 55-kt winds 500 mi west of the center. They were accompanied by 12-ft seas and 33-ft swells. Later that day, the pressure dropped to 972 mb, but 12 hr later was rising as the cyclone pushed against the mountainous coast of British Columbia.

A wave formed south of Kyushu on a stationary front late on the 16th. A LOW also developed over the Sea of Japan. They paralleled the coast of Japan and joined forces on the 18th. The first strong winds were in the warm sector late on the 18th. The EASTERN BUILDER was near the warm front (40.5°N, 167°E), at 0000 on the 19th, with 50-kt winds. Attempting to be impartial, the FUGO MARU was near the cold front (43°N, 162°E) with 45-kt winds. What she lacked in wind speed she made up in wave height with 26-ft swells.

The storm's circulation was now nearly a perfect circle with a central pressure of 960 mb. Gale-force winds were reported in all directions. At 0000 on the 20th, the lowest pressure of 957 mb was reached when the ASIA LOYALTY, near 49.5°N, 164.5°E, struggled with 60-kt winds, 20-ft seas, and 23-ft swells. Another ship to the northeast fought 50-kt winds. It turned out to be the JUJO MARU and 12 hr later was still fighting the battle.

On the 21st, another LOW developed east of the main center elongating the circulation, but it did not help the JUJO MARU as she was still on that 50-kt isotack with 16-ft seas and 40-ft swells. A ship north of the Aleutians was on the same isotack.

The new LOW was rapidly growing and within hours became the major storm. By the 22d, the original LOW was just a trough in the circulation of the new LOW.

This was another storm spawned over the Sea of Japan. It was a slow starter. It came to life on the 20th, but was of little concern until the 22d. By that time it was a large storm, but with a relatively weak gradient and light winds. On the 23d, the winds were blowing. The HOTAKA MARU, at 43°N, 155.1°E, found 50-kt winds with nearby ships reporting 40- and 45-kt gales. The center was moving rapidly across the Bering Sea until it came to a more rapid halt and stalled on the 24th and 25th. On the 24th, the ALASKAN MAIL was north of the Aleutians and headed northwestward with 50-kt winds on her stern. She was being rocked by 25-ft waves. Waves over 20 ft were not uncommon south of the Islands. Ostrov Beringa was measuring 50- and 55-kt winds. The 10,231-ton Liberian bulk carrier GERANIUM, carrying a cargo of logs and scrap iron, was last heard from on the 24th at 56.1°N, 178.5°E (fig. 60), about 300 mi northeast of Attu. Aircraft searching the area after she was reported overdue found a lifeboat belonging ot the vessel, and logs were reported near her last known position. By the 25th, the LOW was deteriorating as the next described LOW took over the wand.

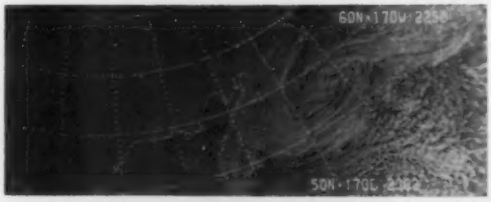

Figure 60.--The GERANIUM was last heard from about 120 mi south of the center of the LOW.

This storm came out of the Yellow Sea on the 22d. On the 24th, it split into two centers straddling Honshu and the eastern center took over. By 1200 on the 25th, it was a 984-mb cyclone with 40-kt winds, and part of the overall circulation of the last storm. The central pressure continued to drop and, at 0000 on the 26th, was 956 mb near 45°N, 177°W. The KINYO MARU, due west of the storm center at 178.5°E, had 60-kt winds on her starboard side. The following ships reported 50-kt winds: JAPAN MAIL (42°N, 177°E), MARITIME VICTOR (52°N, 171°E), SEALAND COMMERCE (42°N, 174°E), and the SHUTOH MARU (37°N, 179°W).

By 1200 that day, the other LOW had vanished. The chart for 0000 on the 27th had as many ship reports plotted in the North Pacific as I have seen. THANKS! The pressure of the LOW was now 950 mb and 45-kt winds common occurrences. High waves were the order of the day. The KIYOSHIO MARU, at 41.2°N, 159.9°W, had 50-kt winds, 33-ft seas, and 33-ft swells. Just to the north the LOTUS' winds were 5 kt lighter, but she fought the same seas. The PAPYRUS MARU was probably in greater trouble near the center (48°N, 164.5°W) with only 25-kt winds, but 16-ft seas from 320° and 33-ft swells from 180°.

The storm continued a northeastward track with gales, but she was now growing old. On the 29th, she was buried on the Kenai Peninsula of Alaska.

The front that was associated with the LOW above stretched westward to the northern edge of typhoon Irma. In midocean, near 28°N, 154°E, a wave formed.

It raced east-northeastward, until 1200 on the 29th, when it was at 43°N, 162°W with a 973-mb center. On its way, there were several reports of gales. The HAWAII was at 43°N, 160°W with 50-kt winds, 25-ft seas, and 21-ft swells. Twelve hours later, the KEISHO MARU was about 90 mi south of the center and battling 60-kt winds, 15-ft seas, and 25-ft swells. To the southwest, the NEDLLOYD DEJIMA, near 41°N, 160°W, was cruising with 50-kt winds, 30-ft seas, and 39-ft swells on her stern.

Gale-force winds continued blowing until the storm stalled near 48°N, 150°W. The pressure was rising by December 1 and it no longer existed late on the 2d.

This was the marriage of two LOWs with very different backgrounds. One was from the subtropics, near 26°N, 156°E, circa 1200 on the 29th. The other was a northerner from near 47°N, 153°E, circa 1800 on the 29th. The northerner was born a bully, battering Ostrov Simushir with 60-kt winds 6 hr later. By 1200 on the 30th, 50-kt winds were still occurring and the LOW had a central pressure of 976 mb. The southern LOW had matured to 980 mb and was headed northward. The LOTUS was near 41°N, 177°E with 45-kt gales and 25-ft swells, while the SHINYU MARU was near 47°N, 155°E with 40-kt gales, 20-ft seas, and 21-ft swells, at 1200 on December 1.

The two storms were introduced on the 1st, and married on the 2d, with the northerner joining the southerner to form a 966-mb LOW near 48°N, 175°E (fig. 61). The stronger wind band--35 to 40 kt--was

Figure 61.--Late on the 2d, the large LOW is on the western arc of the loop.

about 800 to 1,000 mi southwest of the center. On the 2d and 3d, it executed a loop in the vicinity of 48°N, 175°E. At 1200 on the 2d, the PAPYRUS MARU was cautiously sailing into 55-kt winds, 25-ft seas, and 40-ft swells, near 43.5°N, 164.5°E. Not far away, near 41.5°N, 159°E, the EL SALVADOR MARU was braving 45-kt winds, 16-ft seas, and 33-ft swells. On the 3d, the WASHINGTON MAIL and another ship both encountered 50-kt winds with waves up to 25 ft. Twenty-four hours later, the HOTAKA MARU, at 42.6°N, 179.9°E, found the 50-kt wind band and the WASHINGTON MAIL still had 45-kt winds with the seas only slightly lower.

The front had moved far out ahead of the storm's center, and a new low-pressure center formed to the east on the 4th. This new center moved northeastward while the old center moved eastward, still generating gales. In the meantime, another new LOW was approaching from the west to become the system to contend with.

Tropical Cyclones, Western Pacific--The October typhoon attack on the northern Philippines continued into November. Two more typhoons banged across Luzon during the month, bringing the 2-mo total to six. The two big typhoons were Gloria and Irma. Both brought 100-kt plus winds and torrential rains to an already battered and helpless Luzon. Two tropical storms also formed in November.

Gloria was born on the 3d southeast of Yap Island. Moving and developing rapidly, she became a typhoon, by the 4th, near 13°N, 135°E. She turned from a northwesterly to a west-northwesterly track and headed for Luzon. Winds near her center blew at 85 kt early on the 5th. Near her center the FREDERICK LYKES encountered 50-kt winds from the northwest at 0000. The following day winds were up to 110 kt with gusts to 135 kt. She crossed the northeast coast of Luzon late on the 6th and maintained typhoon intensity on her journey across the rugged Island. By the 7th, the now-weakening storm was churning northwestward through the South China Sea; she dropped to tropical storm strength before the day was through. The following day, as a depression, Gloria slowed and turned southwestward before reaching mainland China, about 120 mi east of Hong Kong.

On the 21st, Irma was spotted about 100 mi north of where Gloria came to life. By the 24th, Irma was a big typhoon heading west-northwestward for Luzon. The following day the MIKUNISAN MARU and the ORENDA BRIDGE encountered 40- to 45-kt winds some 200 to 250 mi from Irma's center. She continued to intensify. By the 26th, maximum winds were estimated at 100 kt near her center, which was crossing the 130th meridian near 16°N. The next day winds reached a peak of 115 kt with gusts to 140 kt. Gales extended out 250 to 350 mi. Irma swung west-southwestward. She banged ashore northeast of Manila and turned westward as she crossed the Island. She lost most of her punch during the overland journey on the 28th. Irma dropped to tropical storm strength as she made it into the South China Sea. She continued to weaken, and, on the 30th, turned northward. Tropical storm Irma crossed the coast of mainland China on December 2, about 60 mi west of Hong Kong.

Faye was first detected in the central Philippines as a tropical depression on the 1st. She reached tropical storm strength the following day west of Manila. On the 3d, heading westward, Faye reached peak intensity when winds near her center blew at 50 kt with gusts to 65 kt. The following day she moved into South Vietnam near Bong Son. Tropical storm Hester flared up briefly in the South China Sea on the 15th. She reached tropical storm strength a few hundred miles off the coast of South Vietnam early in the day. Later Hester ran aground, just north of Nha Trang.

Casualties--The American-registered GREEN VALLEY reported heavy weather damage to 42 LASH barges.

Marine Weather Diary

NORTH ATLANTIC, FEBRUARY

WEATHER. Usually the weather over the North Atlantic during February is a continuation of the storminess characteristic of January, and there are years when February weather is the most severe of winter. The average pressure distribution remains quite similar to that of January. The Icelandic Low fills to 1004 mb and is located near 60°N, 40°W. The central pressure of the Azores High drops to 1021 mb near 32°N, 22°W. This reduction in the average north-south pressure gradient is caused both by LOWs being less intense on the average during February, and by the more frequent appearance toward the advent of spring of a blocking HIGH at higher latitudes.

WINDS. Over most of the ocean north of 40°N, the prevailing winds are westerly. The winds over the Norwegian Sea are variable. North of 60°N, between Greenland and Norway, the winds vary about equally from westerly to southerly. West of the Bay of Biscay, the winds are variable. Between 25° and 40°N, the wind direction favors the southwest quadrant in the Atlantic. The direction along the Atlantic Coast of the United States is northwesterly to variable off Florida. Over the Gulf of Mexico it is northerly to southeasterly. Westerly to northwesterly winds dominate the Mediterranean Sea. Force 3 to 5 winds are the most common except off the coast of the Middle Atlantic States, where force 4 to 6 winds prevail. In the ocean bounded by approximately 45°N, 30°W, the Denmark Strait, and the Labrador Sea, force 5 to 7 prevail. The "northeast trades," 25°N to the Equator, blow 65 percent of the time with speeds of force 3 to 5.

GALES. Winds of force 8 or greater occur over 20 percent of the time in an area south of Iceland to south and east of Greenland to the Labrador Coast north of Belle Isle. Another area of gale-force winds is east of Newfoundland, centered about 48°N, 36°W, and 5° latitude in radius. Another area is over the Gulf of Lions. The 10 percent occurrence line extends from about Cabo Finisterre to about 500 mi off Cape Hatteras where it turns northeastward to parallel the coast.

EXTRATROPICAL CYCLONES. This month LOWs form most frequently 150 to 250 mi off the East Coast, from Cape Hatteras northeastward to about the latitude of Cape Cod. This is part of a large area of cyclogenesis that extends from the Gulf Coast of the United States to the Bay of Fundy. Another major area of cyclone development and the path they follow is from the Grand Banks northeastward to Iceland. There also is a primary track northward from Newfoundland to southern Greenland, where it splits into the Labrador Sea and toward Iceland. Other tracks are over the northeastern ocean from west of Ireland toward the Barents Sea, from the English Channel across the Gulf of Finland, and from the Gulf of Lions southeastward across the Mediterranean Sea. The Gulf of Genoa is also a favorite area of cyclogenesis.

SEA HEIGHTS. Seas 12 ft or higher can be expected 10 percent of more of the time north of a line from a couple of hundred miles east of Cape Hatteras to Cape Finisterre, Spain. On the Mediterranean, 10-percent frequencies lie inside an ellipse stretching from Barcelona, Spain, to Crete and then northwestward to Sicily, Sardinia, and the Gulf of Genoa. Another small area of 10-percent frequency lies between Crete and Turkey. The coast of Colombia still hosts a 10-percent line off Barranquilla. An area of over 20 percent is located off the central coast of Norway. The highest frequencies of greater than 30 percent are found over a triangular area between 57°N, 43°W; 45°N, 42°W; and 62°N, 13°W; and in the Denmark Strait.

VISIBILITY. The frequency of low visibility (less than 2 mi) reaches 10 percent or more from Halifax, Nova Scotia, northeastward to a point near 50°N, 40°W, and then northwestward to near Cape Mercy. It also reaches 10 percent on the southeastern North Sea and over the waters around the Faeroe Islands and eastern Iceland. The frequency increases to more than 20 percent inside a coastal region from Cape St. John, Newfoundland, to Resolution Island and then southward to Ungava Bay, and over the Norwegian Sea north of about 72°N.

NORTH PACIFIC, FEBRUARY

WEATHER. February weather in general can be as rough as any month of the year over the middle and higher latitudes. The average central pressure of the Aleutian Low is 1000 mb and is near 51°N, 172°E. The subtropical Pacific High is 1020 mb and centered near 31°N, 138°W. A ridge of high pressure extends eastward from the central China coast. The 1033-mb Siberian High is centered over western Mongolia. The weather regimes are controlled by these three features.

WINDS. Westerly winds prevail over much of the ocean north of 30°N and west of 180°. Northerly winds dominate the East China Sea. Winds are variable over the central Aleutians, southeasterly over the western Aleutians, and easterly near the Pribilof Islands. From the Gulf of Alaska southward to near 40°N and east of 180°, winds are mostly southerly to southwesterly, although other directions are common during the frequent passage of LOWs. Over the extreme northern Gulf of Alaska, the prevailing winds are easterly, and northerly winds are very pronounced over the Bering Sea north of 60°N. The average speed of winds north of 30°N is force 4 to 6, although east of Honshu the wind blows at force 6 or 7, 41 percent of the time. The "northeast trades" extend northward to more than 20°N over most of the western and central ocean and to 30°N over eastern waters; south of 20°N, these winds are very steady. The wind speeds in the trades range from force 3 to 5. The "northeast monsoon" is steady over the South China Sea and the Philippine Sea south of 30°N and west of 150°E. Winds are quite variable over the eastern North Pacific between 30° and 40°N, southwesterly over the east-central ocean between 30° and 45°N, and variable over west-central waters between 25° and 30°N, and 135°E and 180°. Wind speeds over these areas usually average force 4. Northerly winds predominate over the Gulf of Tehuantepec, and in 71 percent of the observations they range between force 2 and 6.

GALES. The frequency of gales near and above 10

percent affects most noncoastal areas south of the Aleutians and north of a line from the waters southeast of Honshu to a point south of the Queen Charlotte Islands and west of Washington State. A maximum incidence of over 20 percent is found over a 200-mi-wide band 600 to 1,000 mi southeast of the southern tip of Kamchatka, an area east of northern Honshu near 37°N, 155°E, and south of the Gulf of Alaska near 52°N, 145°W. Gale-force northerly winds are encountered more than 10 percent of the time by vessels plying the Gulf of Tehuantepec off southern Mexico. These high winds occur when strong northers from the Gulf of Mexico funnel across the isthmus to the Pacific. In extreme cases, they may be felt more than 200 mi out at sea.

EXTRATROPICAL CYCLONES. The storms predominantly follow a northeasterly track. The principal areas of cyclogenesis are off Hokkaido, the East China Sea, about 600 mi south of Unimak Island, and about the same distance southwest of Vancouver Island. Secondary tracks converge 350 mi east-northeast of Hokkaido and head east-northeastward toward the Rat Islands in the western Aleutians. A primary track extends northeastward from the East China Sea to the waters south of the western Aleutians and then runs parallel to that island chain to the Gulf of Alaska. The passage of LOWs over the Gulf of Alaska along the track described above and the one entering from the southwest is more confined to the western portion of the Gulf. The storm path approaching Vancouver Island from the southwest does not contain a maximum concentration of individual cyclones until it reaches a point 600 mi from that island.

TROPICAL STORM activity is at the annual minimum during February. On the average, one can be expected every 4 yr over western waters. As in the other winter months, the principal region of cyclogenesis is east of the central and southern Philippines. Two out of every seven February tropical storms has reached typhoon intensity in the past.

SEA HEIGHTS. Seas of 12 ft or more are encountered from 10 to 20 percent of the time over most of the ocean area between latitudes 30° and 52°N from 140°W to 145°E. A small area with a similar frequency lies over the waters bounding Taiwan where the "northeast monsoon" blows strongly and steadily. Areas of 20- to 30-percent frequency extend between latitudes 44° and 49°N from 172°E to 153°E, and farther southeast 100 to 200 mi around a line drawn from 35°N, 165°E to 40°N, 175°W.

VISIBILITY. Areas of limited visibility (less than 2 mi) occur in more than 10 percent of the observations north of a line drawn from the Yellow Sea through the Sea of Japan, south of Hokkaido, and then east-northeastward to the Alaska Peninsula. A maximum frequency of over 30 percent surrounds the waters around Ostrov Paramushir, south-southwest of Kamchatka.

NORTH ATLANTIC, MARCH

WEATHER. March is a transition month. The weather retains many of the wintry aspects of January and February and at the same time begins to exhibit some features typical of spring. During the first part of March, the weather is generally a continuation of winter conditions, gradually approaching springlike characteristics near the close of the month. However, wide variations from the climatic averages may be expected, and this pattern is not always the rule. The Icelandic Low (1005 mb) rests southeast of Kap Farvel near 58°N, 40°W, while the Azores High contains two 1020-mb centers southwest of the Azores near 27.5°N, between 35° and 42°W.

WINDS from westerly quadrants generally prevail over the major part of the western North Atlantic north of 30°N. Northerly or northeasterly winds blow more often over the waters between southern Greenland and western Iceland than any other winds from the four cardinal and four intercardinal points of the compass. Winds shift to a southerly component as one moves eastward from 35°W and to variable in direction over the Norwegian Sea east of 5°W. Near the coasts of Morocco and Portugal, northerly winds predominate. South of 30°N, the "northeast trades" are the dominant winds over most of the ocean with few exceptions. East of the Florida coast to about 68°W, wind directions are southeasterly to southerly. There is a strong tendency for easterly and southeasterly winds over the Gulf of Mexico. Over the Mediterranean, westerly to northwesterly winds prevail. For the month as a whole, winds of force 4 to 6 prevail north of 40°N (north of 35°N, west of 40°W) and force 3 to 4 south of 40°N (south of 35°N, west of 40°W).

GALES (force 8 or higher) tend to decrease in strength and frequency during the latter half of March. On the average, gale-force winds have been noted in 10 percent of the ship observations north of a line extending roughly from Cape Hatteras to the Bay of Biscay, excluding the southern Norwegian Sea, the waters south of western Iceland down to 60°N, the seas west of southern Ireland to about 33°W, and the waters east of Newfoundland. A small area of gale frequencies greater than 10 percent covers the Gulf of Lions. The maximum frequency of gale occurrence, 20 percent, may be expected from the southern tip of Greenland south to about 55°N and between 40° and 50°W.

EXTRATROPICAL CYCLONES. Principal storm tracks head from the Great Lakes and the Carolina coast to Newfoundland. From Newfoundland, a primary track curves northward to the west coast of southern Greenland, and another track runs northeastward to Iceland and then into the Barents Sea. Over the Mediterranean area, a primary track extends from the Bay of Biscay east-southeastward to the southern Turkish coast.

TROPICAL CYCLONES. Only one tropical storm, a hurricane in the Lesser Antilles in 1908, has been reported in the North Atlantic in the past 104 yr.

SEA HEIGHTS of 12 ft or more are encountered more than 10 percent of the time north of a line from about 150 mi east of Cape Hatteras to Brest, France; in a small area northwest of Barranquilla, Colombia; in the Strait of Otranto between Italy and Albania; and from the coast of Sardinia northwestward to France. A large irregularly shaped area of 20-percent frequency lies in the open ocean bounded roughly by the following coordinates: 60°N, 55°W; 68°N, 25°W; 60°N, 10°W; 43°N, 43°W. Smaller areas of 20-percent frequency lie northeast of Bermuda, west of central Nor-

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way, and in the Gulf of Lions.

VISIBILITY less than 2 mi occurs 10 percent or more of the time over a 400-mi-wide elliptically shaped area extending northeast-southwest from 55°N, 40°W to 42°N, 58°W; over an area of the Labrador Sea from Cape Mercy to Cod Island; over the North Sea from southern Norway southeastward to Denmark and Sweden; and north of a line extending from southern Greenland to north of Iceland and then to the Barents Sea.

NORTH PACIFIC, MARCH

WEATHER. March is normally considered one of the transitional months between winter and spring over the North Pacific. Compared to the North Atlantic, weather improvement is somehwat delayed by the vast expanse of the ocean and the lingering winter climate over Siberia. Stormy weather is about as frequent as in the preceding month along the northern routes, especially from the western Aleutians southwestward to the vicinity of Japan. The 1005-mb Aleutian Low lies about 250 mi south of the Komandorskiye Islands and the Pacific High (1022 mb) rests near 33°N, 144°W.

WINDS. From about 40° to 60°N, winds from the westerly quarter are most frequent, although winds are variable north of the Aleutians and easterly over the Gulf of Alaska. In 40 to more than 60 percent of the observations, the wind force is 4 to 6. However, near the North American coast the most frequent wind speeds are force 4 to 5. West to north winds are most prevalent in Japanese waters south of 40°N where more than 50 percent of all winds vary between force 4 and 6. During March, the northeast monsoon continues to prevail along the Asiatic coast south of Shanghai and over Philippine waters. From 25° to 40°N, wind directions are variable, and the force is from 3 to 5 more than 50 percent of the time. The "northeast trades" are the dominant winds from 25°N to the Equator and extend northward to about 30°N over the eastern part of the ocean. The usual wind speeds, force 3 to 5, persist more than 60 percent of the time over the ocean area under the influence fo the trades. Northerly force 2 to 3 winds blow 40 percent of the time over the Mexican waters out from the Gulf of Tehuantepec.

GALES. In the central and western North Pacific, gales may be expected as far south as 30°N. In this area, north of 35°N and west of 175°W, 10 to more than 20 percent of ship reports contain winds of force 8 or higher. Over the eastern part of the ocean east of 175°W, there is a large reduction in gale frequencies compared to February, and occurrences are generally confined to latitudes north of 35°N. Percentage frequencies of gales in the central Gulf of Alaska, 10 to 20 percent in the preceding month, drop to 5 to 10 percent during March. Gales over the Gulf of Tehuantepec may be expected more than 5 percent but less than 10 percent of the time.

EXTRATROPICAL CYCLONES. The greatest frequency of cyclogenesis in the Northern Hemisphere takes place in the area off the Ryukyus in March. These storms run northeastward to an area about 250 mi east of Hokkaido where they join another primary track coming from La Perouse Strait between Sakhalin and Hokkaido. East of Hokkaido, the primary paths head northeastward to the western Aleutians where they either continue into the eastern Bering Sea or curve to the east-northeast and parallel the Aleutians and Alaska Peninsula until reaching the Gulf of Alaska. Another track extends from 50°N, 160°W, to the Gulf of Alaska. A storm track heads east-southeastward from the Gulf of Alaska to the Alaska Panhandle.

TROPICAL CYCLONES are infrequent during March. A tropical storm can be looked for once every 2 yr over the western ocean. Half of these tropical storms develop further into typhoons. Tropical cyclones during March usually sprout up east of the central and southern Philippines and west of 170°W.

SEA HEIGHTS of at least 12 ft occur more than 10 percent of the time in a somewhat rectangular area bounded approximately by 50° and 33°N, and 155°E and 140°W.

VISIBILITY. The southern limit of 10-percent frequency of low visibility (less than 2 mi) extends from Mys Alevina, Siberia, southward to 42°N, 160°E, and then northeastward to west of Kodiak Island. This frequency increases to more than 20 percent from the waters around the northern Kurils northeastward to the Komandorskiye Islands and then northwestward to Mys Ozernoy.